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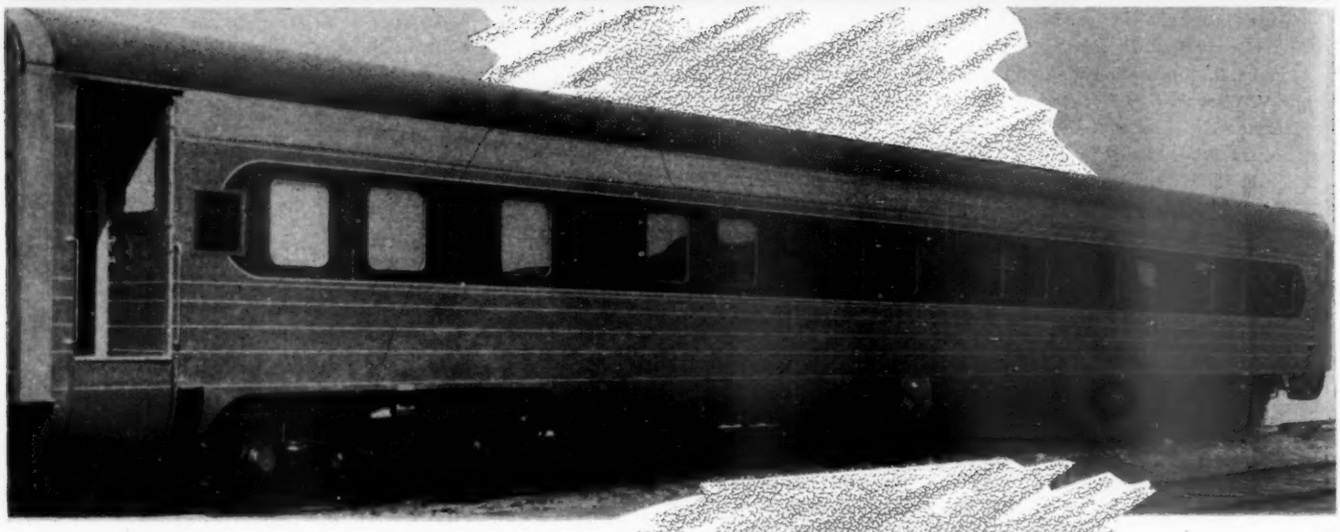
For Modern Passenger Trains



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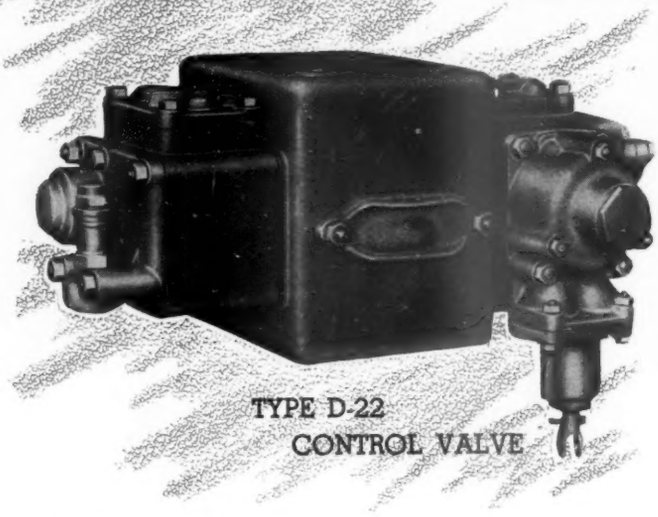

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RAILWAY AGE

How Protect the Public Interest in Transportation?

Transportation is an economic service like the provision of housing or food or clothing. In a non-socialistic society such as ours the meeting of the economic needs of the people (except those who require charity) is not, ordinarily, a legitimate function of government, but of private enterprise. There can be but one excuse for the invasion by government of the domain of private enterprise—and that excuse is the protection of a vital public interest. The intervention of the government into transportation gives it no mandate to free the people who use transportation from the obligation to pay for it, in exactly the same way and for exactly the same reason that people who get food or clothing or housing pay for them.

Uncle Sam as Santa Claus

Unless a man is an out-and-out socialist, he cannot deny the foregoing. And, if he does not deny it, then he cannot justify the building of inland waterways at the taxpayers' expense, merely on the excuse that they will "benefit" this or that group of shippers, or this or that territory. It is none of the government's business to "benefit" this or that territory or group with economic favors paid for by the taxpayers as a whole—and anybody who says it is, is more of a socialist than he is an upholder of private enterprise. As a matter of fact, the government cannot consistently give transportation at less than cost, even if it extends such favors to all shippers, and not merely a privileged few—because who are shippers, anyway, that they should be put on a dole at the expense of the public in general?

Upholders of private enterprise, however, will concede that the government may legitimately invade the field of economic enterprise to the extent necessary for the protection of a vital public interest. But the public interest will require government solicitude on its behalf under only two conditions, viz., (1) the presence of or tendency to monopoly in private enterprise, or (2) the inability of private enterprise to provide facilities which are necessary to the general welfare (which is something quite different from the selfish interest of any section or group in the community).

It is an alleged tendency toward monopoly which legitimizes the regulation by the government of railroad rates and services. Actually, since there is very little monopoly left to the railroads, the justification for the regulation of railway rates and services is pretty tenuous. There still remain about the business only a few faded attributes of monopoly, grounded almost entirely on the limitation upon the construction of new railroads. Regulation of highway and inland waterway carriers, on the other hand, is grounded far more substantially than is that of the railroads, on the fact that the government owns and has paid for the facilities (i.e., the highways and waterways) used by these carriers. He who pays the fiddler has the right to call the tune.

Some degree of government regulation of transportation rates and services, therefore, appears to be justifiable—but definitely less so in the case of the railroads than in that of other carriers who conduct their business upon public property. The second condition justifying the intrusion of the government into transportation (that is, the inability of private enterprise to provide facilities which are needed in the public interest) is present with regard to highway facilities. That is to say, a system of highways permeating the whole country is a facility which the various governmental bodies can probably provide more effectively than private enterprise could. Government intervention in the case of the inland waterways could be demonstrated as advancing the public interest, only if the waterways themselves could be shown to advance the public interest—which would be a difficult demonstration to perform. But, even if highways and waterways could be provided as well by private enterprise as by the government—nevertheless the fact that both facilities *are* provided by the government must be accepted.

Unnecessary to Undermine Private Enterprise

There is, however, no necessary incompatibility between a system of free private enterprise and government provision of some economic facilities *so long as the government does not conduct the enterprises it*

operates in an uneconomic manner calculated to undermine the enterprises still remaining in private hands. But that is precisely the manner in which the government does conduct its transportation business. We discussed this aspect of government invasion of the field of transportation in these pages last week—and our criticisms are fully supported by two authoritative and disinterested bodies, the Brookings Institution and the National Resources Board. In brief, both of these bodies have found that great waste exists (and, hence, *ipso facto,* that the public interest is not being protected) by government expansion of its transportation plant, disregarding the existence or the adequacy of other facilities. Government invasion of the field of private enterprise in transportation, by the actual provision of transportation facilities, which would be justified to the extent that it protected the public interest, is thus shown, on the contrary, to be dissipating the national wealth and income.

To turn now from actual socialized transportation to government regulation of transportation rates—is such regulation fostering the public interest primarily; or has that too subordinated the advancement of the general welfare to that of particularistic interests? We shall not attempt a generalized answer to that question—but the conclusion is unavoidable that the tendency of the Interstate Commerce Commission frequently is to identify a benefit to particular groups or areas with that of the country as a whole.

"Cost" Rates on Naval Stores

Just for instance, take the recent proposed report of Examiner Bardwell in the naval stores rate case. As to the honesty of purpose and the technical skill which Mr. Bardwell and other of the I. C. C. staff have brought to the consideration of this case there is no question. At issue are competitive railroad and motor truck rates on naval stores between interior points in Alabama and Mississippi to ports on the Gulf. The commission's staff has applied cost-finding formulas to both railroad and trucking operations and, on the basis of these "costs," the examiner finds that rates lower by rail than by truck are justified for this movement.

It is not the conclusion which we believe to be questionable, but the method used for arriving at it—because the method, if it is upheld by the commission, might establish a precedent for the disposition of a multitude of railroad and truck rate disputes.

In the first place, a return of 5¾ per cent on the valuation of railroad property was used in calculating railroad costs, while only the value of the trucker's vehicles and working capital was used in calculating truck costs. This procedure, of course, leaves out of account the investment in highway facilities used by the trucks, which are as much a factor in the cost of truck service as investment in roadway is in the cost of railroad service. To arrive at a true comparison of the relative economy of truck and railroad transportation, it is necessary that the proration of roadway costs be made in the same manner for both agencies. It may, of course, be argued that the so-called truck "taxes" reflect the capital costs of the roadway used by trucks; but a comparison of these "taxes" as levied in different states would convince anyone that they cannot be accepted as an accurate statement of actual roadway costs—they vary far too widely.

Truck "Taxes" No Measure of Real Costs

The protection of the general public interest being the only justification for transportation regulation, it follows that the system of rates laid down by the regulators should be one which will encourage traffic to be transported by those methods which operate at the lowest actual costs. By the arbitrary assumption that truck "taxes" are the equivalent of the actual costs of highway facilities, the regulatory authorities are running the risk of diverting traffic from less costly means of transportation to more costly means. If they do so divert traffic, their action will reduce the national income and, hence, injure the public interest. If it harms rather than protects the public interest, then what useful social purpose does government regulation serve?

But it is not alone in the use of dissimilar calculations of "costs" as between rail and highway that this report appears to disregard the true public interest. It has also overlooked the fact that the truck service does not offer to supplant railroad service, and take over the major railroad job of long-haul transport of relatively low-grade commodities. Does protection of the public interest permit regulatory authorities to ignore a consideration of the relative contribution to "public convenience and necessity" of two competing agencies of transportation? These naval stores are moving in the direction of the railroads' normal empty haul. Without the naval stores business, the cars would be handled anyway. Anything which the traffic brings in, therefore, over and above its actual out-of-pocket costs, would be that much of a help to the railroads, enabling them the more surely to maintain their nationally-essential long-haul services which the trucks are not offering to take over.

Essentials for Protection of Public Interest

We are not here contending that a particular railroad is necessary to the national well-being. We do maintain, however, that the Commission cannot decide a case such as this one in the public interest without some consideration of the relative "public necessity" of rival agencies competing for the same traffic. **The maintenance of socially-necessary transportation services must be the primary goal of any regulatory policy which has as its purpose the protection of the public interest.** Once that condition is satisfied, and it is

found that the maintenance of necessary agencies has been provided for, **regulation in the public interest should next encourage the development of a system of competitive rates reflecting the truly comparable economic costs of the competing services, so that the rate structure may induce traffic to flow through the channels of lowest social cost.**

It is only after meeting these two tests for the promotion of the public interest that the regulatory authority may properly consider, as a guide for its action, the benefits which proposed rates or other regulatory policies may confer on a particular locality or a particular group of shippers.

Methods of Economics Are Needed if It's Economy We're After

So far, government invasion of the field of transportation has produced remarkable developments in the domain of engineering. It has likewise been the source of praiseworthy advancement in law and accounting. In the realm of economic accomplishment, however, the record of the government in transportation has been a total failure. This is equally true, where the government has provided transportation facilities directly (waterways and highways) and where it has regulated private transportation enterprises (notably the railways). However successful our system of highways and waterways may be from an engineering standpoint—they are a colossal failure as self-supporting economic enterprises. However great may be the advances in legal and accounting science which have come as a result of government regulation of railroads, the railroads themselves after over 50 years of regulatory experiment are certainly no advertisement for the economic success of the process.

Is it not obvious that the failure of the government's relationship to transportation lies entirely in the lack of direction of this relationship to economic ends? Such economic effects as have resulted from the government's activities have been incidental to the pursuit by government authorities of legal or accounting or engineering objectives. Technical experts are needed, of course, in the application of government policies to transportation —but the troubles of transportation today lie primarily in the field of economics rather than in law or engineering; hence men of sound scholarship in economics ought to be the government's main reliance in dealing with transportation. Direction is needed of the caliber of that responsible for the recent Brookings Institution report on government reorganization and the "Progress Report" of the National Resources Committee. Men who know the balances of price and production which are required for the effective functioning of our complex economic machine; and who will know how to make transportation contribute to such a balance, rather than detract from it, as it does today—such is the need if government policies toward transportation are to promote the national wealth and income.

The Delights (?) Of Ownership

The normal delights of ownership are open to grave question when, as in the case of the railroad industry last year, the tax collectors take $341,000,000 and the owners take a loss of $123,000,000. The year 1938 marks the eighth consecutive time in which the railroads have paid out more in taxes than they have earned in net income for their owners.

The total net income earned by the railways in the last eight years amounted to $120,000,000. That was the owners' share, available for additions to property, reserve funds, dividends, etc. But while the railways were earning $120,000,000 in net income, they paid in taxes, during these same eight years, the sum of $2,291,000,000. In other words, for every dollar paid in taxes, only a little more than a nickel was earned in net income. Or, to state it differently, for every dollar of net income earned in the last eight years the railroads paid out $19.09 in taxes.

So heavy has been the tax burden upon the railways in recent years, in comparison with their net income, that the figures must be extended back over a period of fifteen years before net income, in the aggregate, catches up with taxes. In the ten years 1929-1938, net income totaled $1,541,000,000: taxes amounted to $3,036,000,000. In the fourteen years 1925-1938, net income amounted to $4,510,000,000: taxes were $4,549,000,000. In the fifteen years 1924-1938, net income was $5,069,000,000, while taxes were $4,890,000,000.

The owners had quite a lead over the tax collectors from 1924 through 1930, but this lead was lost on the downgrade in 1931 and the totalizer shows for the last eight races—1931-1938, inclusive—an average payoff of $38.18 for $2 on Tax Collector—*not* a favorite, in spite of the fact that he's always in the money.

Overnight Merchandise Trains

While doubt exists on certain railways as to whether less-than-carload traffic is profitable, other railways, by the provision of modern service and alert, aggressive solicitation, are proving to their satisfaction that merchandise business will produce satisfactory revenue, even in light traffic territory. The latest development is the inauguration by the Southern Pacific, on February 1, of a fast, overnight merchandise train from Los Angeles to Southern Arizona points, saving 24 hours to all the points it serves directly, and to many others as well, by means of connecting trains. This represents a further extension of the successful merchandise service built up by Southern Pacific in the last 10 years between Portland, Ore., and Los Angeles, Cal., in the form of a fleet of overnight merchandise trains which are demonstrably making money.

Similar services are to be found in other sections of the country, and on all such trains the reports are favorable. They are getting business and making money. This is not guess work, as several of the roads have prepared elaborate and convincing statistics covering the operation of the trains, which show satisfactory profits after all cost factors have been considered.

Two or three of these trains are operated as units over two different railroads, passing through the interchange terminals without being broken up. This is an important development, since it eliminates one of the most fruitful sources of delays to l. c. l. traffic by doing away with slow and cumbersome terminal and interchange handling. At least one road, also, has increased its merchandise revenue considerably by making special studies to improve terminal interchange of l. c. l. traffic.

It has been demonstrated, however, that the mere provision of such service is not the whole answer. That, of course, is the basic, important step, but it must be backed up by an aggressive sales campaign, and, more than that, by studies of what the shippers actually want, not only as a group, but individually. Railways which have put on crews of transportation and traffic men to go over the system and find out why shippers are using competitive forms of transportation have discovered many cases where small adjustments in operations would meet whatever objections the shipper had to using the rails, and bring back much valuable traffic.

Merchandise is the most highly competitive traffic in present-day transportation, and to secure its haul over the rails, the best sales talent available must be called into play. It is not sufficient to have traffic representatives give it what little time they have left after important carload business has been solicited. The best results are obtainable only when separate officers and traffic men are designated to handle and solicit merchandise as their first and most important job. Securing merchandise business for the railways presents a real and complicated sales problem that cannot be solved by part-time or halfway measures.

What Will the Traffic Bear?——5

Granting, for purposes of discussion, that the railroad rate structure was founded upon "what the traffic would bear" 40 years ago, who can show that the present structure is similarly based on what the traffic will bear? This is a fair question, because the rate changes of the past 25 years have not been upward on this commodity and downward on that, as commodity prices fluctuated (which is the way rate adjustments would be made if the what-the-traffic-will-bear theory were strictly adhered to.) Instead, rates have been altered by applying a conglomeration of percentage formulas, giving results which can have no logical relation at all to "what the traffic will bear." For example:

Before effective federal regulation in 1907 and until 1915 the five basic rates applicable to the great bulk of manufactured products moving between New York and Chicago, taken as typical, were as follows:

Classes				
1	*2*	*3*	*4*	*5*
75c	65c	50c	35c	30c

Today these rates have become

Classes				
1	*2*	*3*	*4*	*5*
167c	142c	117c	84c	58c

The first four classes move most of the l. c. l. Fifth class moves the greatest amount of carload shipments of manufactured products. The weighted average of l. c. l. traffic approximates third class, and the carload class for the same commodity is more usually two classes lower, or fifth class.

Because of Rule 10 of the Classification, l. c. l. may be concentrated into carloads and shipped at the carload rates. To illustrate the effect, carload earnings of articles rated third class l. c. l. and fifth class carload are shown in the following table:

	Earnings Per Car	
	1915	1938
Less-than-carload	$180.00	$421.20
Carload	108.00	208.80
Net difference in favor of carload	$72.00	$212.40

In other words, there is now more than $200 per car difference between the l. c. l. and the carload rate, out of which the forwarder can make sufficient concessions to attract all the remunerative traffic, and still retain a nice profit for himself.

There is a large volume of traffic in both first and fourth class that will weigh 20 pounds or more per cubic foot and load the maximum in the average truck body. The difference between first and fourth class truckload earnings would have been $80 with 1915 rates, but the difference today is $218. It is such hills and valleys in the rate structure which invite the pick-and-choose competitor—he taking the hills and leaving the railroad the valleys.

Average commodity prices are only 23 per cent higher today than in 1915, but the first class shipper is paying rates 123 per cent higher, on the basis of the figures shown above. If 1915 rates were "what the traffic would bear"—what are present rates? Can the first class shipper be blamed for trying to "decentralize?" Moreover, the spread between fourth class and first class has risen from 40 cents to 83 cents—or more than 100 per cent. Is it any wonder that a shipper looks with favor on competing agencies of transportation which take his products out of first class and put them in the fourth?

Steam or Diesel-Electrics?*

An evaluation of the characteristics of the two types of motive power for high-speed passenger-train service

By L. K. Sillcox†

SEVENTEEN barrels of oil in a Diesel-electric locomotive will haul a high-speed, de luxe train at 80 m.p.h., non-stop, from New York to Boston, Mass. Seventeen barrels of fuel oil, fed into the firebox of the steam locomotive scarcely will move the same 12 heavy cars as far as Bridgeport, Conn., eastbound. There is a 4.5 to 1 advantage shown in favor of the Diesel. It represents the improvement in overall thermal efficiency secured by the direct combustion of oil above the piston of the Diesel as compared with its atomization within a locomotive furnace, the evaporation of boiler feedwater, and subsequent expansion of steam in two simple cylinders of large dimensions.

Locomotives are not selected on the basis of thermal performance alone. Under certain circumstances, it might be difficult for a railway to satisfy its motive power requirements at a capital cost of $100 per installed horsepower. The Diesel is not adapted to burn coal, and there are pronounced territorial influences on the relative fuel costs. The personnel and facilities for the maintenance of steam locomotives, highly proficient in all familiar operations, often prove most awkward and incompetent when called upon to transfer their skill and adapt their physical routines from boilers, grates, 1,500-lb. rods, and 80-in. wheels, to crankshafts, fuel-injection systems, timing mechanisms, electric generators, and traction motors. Despite the fact that thermal efficiency is not the only advantage of the Diesel, the simplicity of the steam engine is preventing any early supersession of the type.

Thermal Efficiencies

Typical heat balances of the two types, when permitted to operate at rated capacity, distribute the calorific value of the fuel as shown in Table I.

A vast amount of research and experimentation will be required to narrow the margin of relative fuel utilization of the two motive-power types. The steam locomotive still predominates in road service despite its shortcomings in this respect. Practical considerations will make it difficult to broaden the temperature range in which the Diesel operates. It already approaches practical attainment of its Carnot efficiency equivalent. The steam pattern must be vastly improved to display a similar degree of efficient utilization of heat.

Table I—Comparative Heat Losses of Steam and Diesel Engines—Per Cent of Total Heat in Fuel

	Steam	Diesel
Boiler:		
Radiation	3.3	
Unburned coal	16.3	
Carbon monoxide	0.6	
Heat in smokebox gases	11.1	
Total losses	31.3	None
To auxiliaries	3.3	2.5
Cylinder radiation, throttling, etc.	5.8	1.6
To jacket cooling water	None	33.2
Available heat in exhaust	51.7	24.2
Machine friction	1.2	10.6
Recovered and developed as useful work:		
Drawbar horsepower	6.7	27.9
	100.0	100.0

It is a severe limitation of the steam locomotive that the vast temperature range between firebox and exhaust steam cannot be utilized by any known system of generation. It is impossible to raise the steam temperature of the total heat in the steam by any great amount in consequence of the tremendous pressures which would be required and the metallurgical and cylinder-lubrication difficulties which very high temperatures would invite. There seems no escape from these limitations.

The pressure limit might be overcome by the substitution of another medium for water and its vapor. Mercury has been fully exploited in central-station boilers, feeding steam turbines. Its weight and cost forbid such an application in steam locomotive services, and it is truly practicable only in turbine drives. Some such fluid as a hydro-carbon oil, having a much higher boiling point, might be used in place of water. In such case, the upper temperature limit quite readily could be increased. Substantially elevated temperatures could be withstood without expecting insurmountable metallurgical difficulties. But, unless the cycle were to differ markedly from that of the conventional steam locomotive, there would be little if any benefit derived. The effect would be that of elevating the entire temperature range without broadening it. To secure any real advantage, it would be necessary to employ a binary cycle—the oil engine receiving vapor at the highest temperature, expanding it to the saturation temperature of the oil, condensing the vapor and further cooling the liquid by transferring its heat to water and thus securing a reduction in the final expansion temperature.

The Diesel-Electric as a Switching Locomotive

It was ten years after acceptance of the Diesel-electric locomotive in switching service before a railway found justification for an experimental Diesel installation for use in the hauling of high-speed passenger trains.

The Diesel has one very serious disadvantage when compared with the conventional reciprocating steam alternative. On an equal rated horsepower basis, the Diesel costs three to four times as much as a comparable steam design. In switching service, however, half the installed Diesel capacity will serve more efficiently than the full complement of power in a steam equivalent. The reason is disclosed in the manner and in the speed range in which power is normally applied. The Diesel engine, supported by an electric transmission, is enabled to deliver its full rated power to the generator shaft at all locomotive speeds. The torque of the traction motors in starting and at low speeds is limited by the motor characteristics, the capacity of the motors to receive high current input without damage, and, by the friction be-

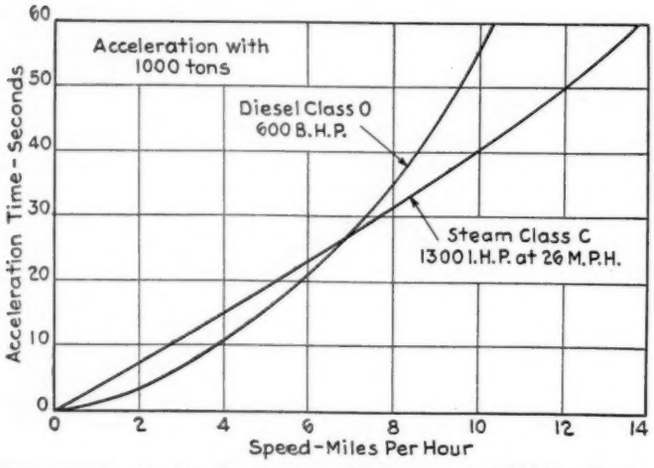
* Abstract of a paper presented before transportation engineering students at Yale University on March 8.

† First vice-president, The New York Air Brake Company, New York.

tween wheel and rail, to support the wheel reaction without incurring slippage.

On the other hand, a steam locomotive is limited in its maximum starting torque, first, by rail friction, and, second, by the torque delivered by steam pressure on a piston of fixed dimensions. Since the maximum driving impulse of the steam locomotive is delivered at four points during each revolution of the driving wheels and the propelling force falls to approximately 85 per cent of the maximum as the cycle progresses, full advantage cannot be taken of the actual weight on drivers to apply starting effort continuously to the limit which rail friction would permit.

For all switching speeds up to 6 m. p. h., a 1,200-hp. Diesel-electric locomotive delivers higher torque and thus can accelerate maximum tonnage more rapidly than can a steam locomotive of 2,100 hp. Its superiority over a steam locomotive of 1,500 hp. extends to 7 m. p. h., and over a 1,300-hp. steam locomotive, to 11 m. p. h. Corresponding Diesel advantages at low speeds over steam characteristics in much larger locomotives are apparent both in 900- and 600-hp. Diesels. The curves present steam vs. Diesel capacity in terms of time required to accelerate trains of 1,000 tons using a 1,300-hp. steam, or

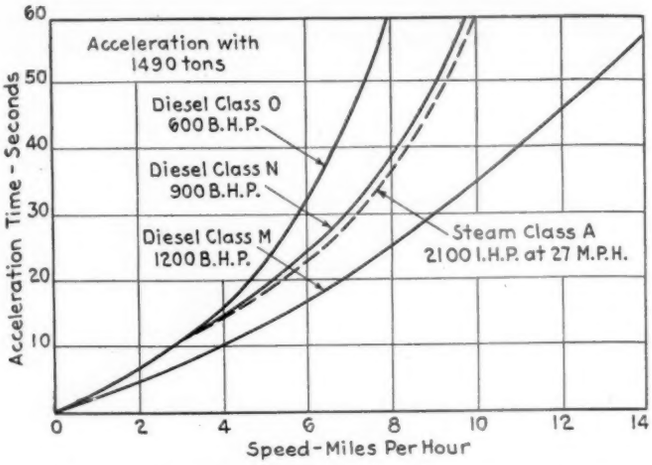


Comparison of the Acceleration Times of a 1,300-Hp. Steam Locomotive and a 600-Hp. Diesel-Electric Locomotive Handling a 1,000-Ton Train

a 600-hp. Diesel, and of 1,490 tons, using a 2,100-hp. steam, or any one of three Diesel capacities.

Most close switching is accomplished with 6 m. p. h. seldom exceeded. Whenever speeds are low the Diesel-electric can invariably perform more work per hour and hard and critical experience shows it regularly capable of more hours per day than the steam locomotive it replaces. All these advantages, important as they are, would be entirely without effect if Diesel operation were to entail any considerable increase in hourly operating costs. However, such dependable operating records as are available clearly demonstrate remarkable overall economy for oil engines. And such records must, of necessity, relate to the early designs of the type.

One eastern railway has been operating six 100-ton, oil-electric switching locomotives over a period of seven years. Each of these units is powered with two 300-hp. oil engines of compression-ignition type. Steam switching power of 0-6-0 wheel arrangement was replaced upon introduction of the Diesels, and dependable operating and cost data are available. The hourly charges which are tabulated cover all costs as recorded over a period of 30 months of simultaneous operation of locomotives of both types in similar service. A comparison of the loco-



Comparison of the Acceleration Times of a Steam Locomotive Rated at 2,100-I.Hp. and 600-, 900- and 1,200-B.Hp. Diesel-Electric Locomotives Handling 1,490 Tons

motives and of their operating costs are shown in Tables II and III.

Comparisons of this type show the Diesel to be less costly to operate than the steam locomotive which would be required to replace it. Of added advantage is its adaptability to the work involved in normal switching operations, and it incurs no expense for stand-by fuel and accessory items. Strictly modern Diesels should present even more favorable operating comparisons. Railways are fully aware of these advantages as disclosed by the switching-power purchase records of recent years.

While the Diesel-electric locomotive, constructed in accordance with most direct and rational design, inherently offers characteristics favorable to compliance with many of the exacting requirements for high speed,

Table II—A Comparison of the Dimensions of Steam and Diesel-Electric Switching Locomotives

	Steam	Diesel
Age of units at time of record, years	16-20	5
Weight in working order (includ. tender), lb.	272,000	215,650
Weight on drivers, lb.	169,000	215,650
Wheel arrangement	0-6-0	4—4
Diameter of driving wheels, in.	51	40
Number of engines	.....	2
Number of cylinders (each oil engine)	2	6
Bore and stroke, in.	21 x 26	10 x 12
Diesel engine type		Four-cycle, solid injection
Rated horsepower (each oil engine)	1,400	300
Speed at rated horsepower	30 m.p.h.	550 r.p.m.
Steam pressure, lb. per sq. in.	180	.....
Total heating surface, sq. ft.	2,200	.....
Superheating surface, sq. ft.	357	.....
Grate area, sq. ft.	43	.....
Tender capacity:		
Gallons of water	5,500	.....
Pounds of coal	13,000	.....
Traction motors	.....	4
Maximum tractive force at starting, lb.	34,000	66,000
Maximum tractive force—one hour, lb.	.....	33,000 at 4.5 m.p.h.
Continuous rated tractive force, lb.	.....	24,500 at 6.3 m.p.h.

practicably operated, other features indirectly, but no less forcefully, have encouraged its use in preference to advanced patterns of reciprocating steam locomotives. It may be that one of its important advantages is the high cost of the power plant and electrical equipment, since this controlling item of expense has placed a practicable limit on the installed power which can be used to perform a specified service and has stimulated development of lightweight construction of railway car equipment.

By actual timing, it has been shown that, in a regular 18-hour, 800-mile run of a conventional 12-car passenger

train, hauled by a steam locomotive, 115 min. are consumed in standing at 30 intermediate stops. A loss of 92.4 min. is suffered while operating at reduced speed, accelerating and decelerating, producing a total of nearly 3½ hours lost time, almost 20 per cent of the scheduled time.

This comparison shows, of course, the benefit in total time elapsed if it were possible to run non-stop. In the 3½ hours lost, however, are 36 min. for taking on coal and water, directly chargeable to the locomotive, representing time expended in addition to the standing time at stations which is enforced by platform work.

Track pans for filling the water compartment of tenders without necessitating stops and the burning of oil in place of coal reduce steam-locomotive time lost for taking on supplies and eliminate the need for periodic fire cleaning. Roller bearings and oil lubrication permit long locomotive runs without servicing of rod bushings. Many of the natural delay handicaps to which the steam locomotive is ordinarily subject can be removed by careful design and preparation. By such studied attention, a certain amount of dead road time can be saved.

Table III—Comparison of Service Hours and Operating Costs of the Locomotives Described in Table II

	Steam	Diesel
Service Comparisons		
Service hours per year	4,650	6,500
Equivalent availability, per cent	53	74.2
Basic Fuel Costs		
Coal, per ton on tender	$1.63	....
Oil, per gallon on locomotive	....	$0.042
Service Costs per Hour of Operation		
Fuel	$0.820	$0.296
Water	0.036	....
Lubrication	0.020	0.044
Repairs	0.725	0.535
Enginehouse expense	0.505	0.016
Other supplies	0.024	0.024
Wages, two men	1.490	1.490
Total	$3.620	$2.405
Relative Investment per Unit		
First cost, typical	$41,000*	$70,000**
Fixed Charges on Equivalent Service-Hour Basis		
Depreciation at 4 per cent	$0.353	$0.436
Interest at 5 per cent	0.441	0.790
Insurance and taxes at 2 per cent	0.177	0.316
Total	$0.971	$1.542
Total hourly cost (Service costs per hour of operation plus fixed charges on Equivalent Service-Hour Basis)	$4.591	$3.947
Ratio of net cost—Diesel to steam	0.862	

*Estimated for 1939—Steam switching locomotives of study actually cost $22,000 each in 1918. Strictly modern units would be more economical in fuel and water.

**Estimated for 1939—Diesel-electric switching locomotives of study actually cost $102,700 each in 1930.

Confronted with conflicting necessities for providing a long piston stroke, but limited piston speed, the locomotive builder is compelled to look to increasing driving-wheel diameter as the only means whereby high speeds practicably and efficiently may be operated. Then, the barrel of the boiler rises to keep clear of the higher wheels. With the boiler, the center of gravity of the entire structure rises. It becomes less stable upon any curve of given degree and superelevation, but more considerate of track and riders as lateral rolling upon the supporting springs replaces heavy thrusts upon the rails in adjusting locomotive length to changes in direction. The Diesel, offering complete latitude in the placing of equipment within the cab, in so far as operation is concerned, has the engine and generator low in a sub-frame. The traction motors are upon the trucks. The center of gravity of the Diesel-electric locomotive is 24 to 30 in. lower than that of an equivalent steam locomotive.

Safe limits for stability on curves are generally taken in accordance with stationary structure practice, requiring that the direction of resultant effects, combining equipment weight and centrifugal forces, fall within the middle third of the track gage. Whether or not this is a proper selection matters little, since, in passenger service, passengers will sense discomfort and alarm long before the vehicle approaches the point of overturning. Experience has taught that a 3-in. unbalanced superelevation of outer rail is tolerable from the standpoint of passenger comfort with conventional equipment.

Recent designs of trucks are so arranged as to give passengers a greater sense of security when traversing curves at high speed. The lower center of gravity permits greatly increased speeds to be operated on curves without hazard of overturning, and light weight assists in holding guiding stresses at the rails within permissible limits while operating at increased speeds. Actually, speed increases of 15 to 25 per cent on curves have been reported as satisfactorily operated with the installation of Diesel-electric power and with no change in track structure. Thus, the Diesel-electric is justified in claiming another inherent advantage in high-speed road service.

Uniform Torque Permits Higher Speed Limits

The gear-driven wheels of the Diesel have no concentrated weights. They are symmetrical about all axes. They produce no dynamic augment, and slipping of wheels is both less common and of less consequence. Some steam locomotives have displayed violent slipping and stress multiplication tendencies. In the most modern examples of steam locomotives, in which every refinement has been incorporated to assist free running, slipping can attain dangerous speeds with no indication being given the men in the cab who, if conscious that slipping were occurring, could take prompt measures to prevent its attaining dangerous limits.

The fact that costly damage has been done by high-speed reciprocating steam locomotives does not condemn the type. It shows that vastly more work must be done in some directions before the designer's task is done. Practice has balanced 50 to 75 per cent of the reciprocating weight. Research has reduced the mass of the parts involved. There has been a general lack of appreciation that the proper fraction of balance is not correctly expressed as a per cent of total rod-and-piston-assembly weights involved. A more direct and reasonable approach is the determination of the reciprocating weight, expressed as a percentage of total locomotive weight, which need not be balanced. This view is being recognized, and we may predict, with assurance, that high-speed steam locomotive designs of the future will require less weight in the counterbalances of driving wheels to neutralize nosing than has heretofore been the practice. Dynamic vertical effects will be reduced in proportion, and a serious objection to the use of steam locomotives for high speed, an objection from which the Diesel-electric can claim complete freedom, will be overcome.

Locomotive engineering defects and peculiar design limitations are almost as clearly evident in train-operating and despatching practices as they are in maintenance and accident records. The locomotive which must reduce speed most often or to lowest levels in encountering curves, bridges, or weakened track sections is at a serious disadvantage. If it must stop for water or slow down for track pans, it suffers again. If it is more hazardous for one motive-power type to attain the same speed ceiling that another has established for the reason that it is likely to damage track, or if it represents power under imperfect control due to braking inefficiency, it must find compensation in another direction, or forfeit limited

services to a motive-power type which is better fitted to satisfy the difficult conditions set up.

Braking—Two Predictions

The locomotive is less effectively braked than the cars which it hauls. Thus, locomotives are responsible for lengthening stopping distances. There are three reasons why the steam locomotive has never been adequately braked as judged by car-braking standards. Fully efficient brakes on the guiding trucks have been avoided, because it has been felt that their application would interfere with guiding action and, thus, with safety. Driving wheels have not been heavily braked, since it is held that the heat developed in braking would loosen tires and introduce a hazard from that source. Locomotive tenders have not been adequately braked under operating conditions of partial to full complement of coal and water, since design contemplates possible heavy braking with supplies nearly depleted.

In braking, as in running, some advantages are inherent in the Diesel. For some reason, locomotive designers do not hesitate to brake leading wheels fully when they are also driving wheels placed at the ends of a car-body-type cab. Wheels beneath the Diesel-electrics constructed up to this time are of small diameter, car-type, wrought-steel pattern. Although subject to the not uncommon tread defects of shelling and thermal cracking, and heavily loaded as well, rates of heat dissipation enforced upon Diesel road locomotive wheels generally exceed those common to the trailing-car wheels. Of course, there are no tires to loosen, and this is judged, improperly perhaps, sufficient reason for raising the braking standard to levels well above those employed upon steel-tired cast wheel centers. Then, too, Diesel-electric locomotive light-to-full-load-weight variation is much less than corresponding differences in steam locomotive and tender combinations. In fact, it has been unnecessary to respect this weight change in Diesel practice, because of the inability to fit brakes to heavily loaded Diesel wheels which, within established limits of permissible shoe pressures, will produce retardation rates as high as those of which the cars are capable.

Two predictions appear reasonable at this point. First, electric-locomotive practice and (more recently, turbo-electric-locomotive design, produce units of exceptional stability in running with swiveling guiding trucks at the cab ends and intermediately placed driving wheels of larger diameter. While this wheel arrangement holds the disadvantages of some sacrifice in adhesive weight and a probable increase in height of center of gravity, still any reduction in wheel difficulties and reduced track stresses strongly recommend its acceptance by designers of Diesel locomotives for road services. We shall, doubtless, find Diesel locomotives so constructed, unless the wheel and braking difficulties are simultaneously relieved by some new development yet unforeseen.

Second, in view of present motive-power braking limitations, the acceptance of brake types which are more efficient than the present tread brake, which may be installed to any desired capacity, and which introduce no heat reactions in the wheel treads, may be expected. Axle mounting of separate discs and drums upon which the brake shoes react is common in European practice. Both rotors and drums are, and long have been, regularly employed in automotive applications. There is a new appreciation of the need for a railway brake of corresponding type as wheel-tread temperatures are held primarily responsible for reduced wheel mileage and the occurrence of the more common types of tread-metal disintegration.

A Diesel-electric locomotive can be designed to accomplish within railway clearance limits service equivalent to, or superior to, that of any steam locomotive constructed to date and possessing, at the same time, the inherent advantages of the Diesel. Nor is there much consolation in scanning the comparative cost records. Instructive data were recently accumulated from the offices of various railways by Coverdale and Colpitts, consulting engineers of New York. Their report shows operating expenses, wages, fuel, water, lubricants, maintenance, train supplies, and enginehouse expense for the Southern Pacific steam-hauled "Sunbeams" to be 80 cents per train-mile, compared with 62 cents for the Diesel Denver Zephyrs of the Burlington. These trains have similar passenger capacity. The daily mileage obtained from each Diesel is four times that required of each Southern Pacific steam locomotive.

The operating cost, involving the same items, of the steam-driven Hiawathas of the Milwaukee is twice that of the Burlington's Twin Cities Zephyrs, while offering but 50 per cent more capacity and operating half the daily mileage. The Baltimore & Ohio runs its Diesel-hauled Abraham Lincoln opposite the steam-driven Ann Rutledge; operating costs show 91 cents per train-mile for the Diesel and 97 cents for the steam. Train consist and daily mileage are identical. The Union Pacific's steam-hauled Forty-Niner costs half as much to operate and offers half the capacity of the Diesel-electric City of San Francisco. Both cover identical mileage.

When studying such comparisons as above, it is necessary to recognize the limitations imposed by dissimilar accounting practices current upon the various railways. It is probably safe to conclude, however, that the mile-by-mile operating expense of the Diesel certainly should not exceed that of steam. For facilities of equal standards in either type of train, the cost of cars would be identical, and, for the luxury trains of the type reviewed in the analysis, car cost is high—so high, in fact, as to conceal, in total train-cost figures, much of the added cost of the Diesel power plant.

Then, too, availability must be considered. The steam locomotive which demonstrates 65 per cent availability is exceptional, due, in no small measure, to lack of incentive to improve the record. This is compared with proved Diesel availability of 95.4 per cent for all Burlington Diesels from their dates of installations to July 1, 1938; 84.6 per cent for the "Green Diamond" of the Illinois Central for the year ended July 1, 1938, and 98.5 per cent for both "Rebel" trains of the Gulf, Mobile & Northern over the same period. Such intensive use goes far toward justifying high initial cost.

Perhaps the reciprocating steam locomotive has been burdened with precedent. Stepping up the tempo of long-established practice is often painful. Inertia, the product of years of steady plodding, exerts tremendous pressure against the urge to revolutionize to meet a new situation. With evidence all about us, pointing toward revival of interest and study into means whereby the steam locomotive will truly compete with the uniform torque designs, years of engaging interest in the struggle for motive-power dominance are assured.

The Diesel has a current advantage. It was born with it. Every steam pattern must struggle to earn characteristics which are the natural heritage of Diesel power. Service to the public and cost economy will govern. The designers of steam power recognize their problem, and they are competent men. It seems unreasonable to expect the Diesel to displace the steam locomotive in road freight and passenger service as it has in the performance of yard work, yet it will, unless steam can attain full stature to meet the work to be done.

Chicago Great Western Raps A. A. R.

P. H. Joyce charges it with failure "to bring about any improvement" as he asks Congress to direct I. C. C. to act

WASHINGTON, D. C.

BECAUSE the Association of American Railroads "has failed to bring about any improvement in the railroad situation," the trustees of the Chicago Great Western would have Congress direct the Interstate Commerce Commission to "exercise the authority it now has to remove injustices and bring about proper conditions within the industry." Such a line of action was urged upon the House committee on interstate and foreign commerce by Patrick H. Joyce, co-trustee of the C. G. W. who read a brief statement at the March 14 session of the hearings on Chairman Lea's omnibus transport bill—H. R. 2531.

Mr. Joyce said that the C. G. W. was not "squawking" about the A. A. R. from which "many benefits" have come to the railroads; but he claimed that when the Association was organized the railroads "were led to believe that they were going to straighten out the situation." If they have done that, Mr. Joyce added, "it's a secret;" and he thinks the Interstate Commerce Commission might supply the railroad industry's need for a "Will Hays or a Judge Landis."

Great Western criticisms of the A. A. R. and its dissatisfaction with present divisions of joint rates and mileage rentals for refrigerator cars owned by railroad affiliates have previously come to the fore in testimony of C. G. W. trustees in the Ex Parte 123 rate-increase case and in Senator Wheeler's investigation of railway finances. Last Saturday the I. C. C. made public an order granting the C. G. W. petition for a reopening of the No. 15234 proceeding which was concerned with divisions in Western and Mountain-Pacific territories. In his statement before the House committee Mr. Joyce complained of delays in commission proceedings, pointing out that this petition was filed by himself and his co-trustee—Luther M. Walter—more than six months ago, on August 26, 1938.

More Opposition from Waterway Interests

Mr. Joyce's statement came toward the end of the March 14 session, and thus he was not questioned by committee members who had for several days been listening to presentations on behalf of waterway interests. Chairman Childe of the Mississippi Valley Association's traffic committee, whose testimony was reported in last week's issue, was followed by Harry A. Feltus of the Upper Mississippi Waterways Association, who represented also various local farm organizations in communities along the Mississippi. The latter, he said, had instructed him to oppose any regulation of water carriers and repeal of the Interstate Commerce Act's long-and-short-haul clause. None of the groups he represented, Mr. Feltus said, can be styled "anti-railroad," but all are "pro-transportation;" and they believe that long-and-short-haul-clause repeal would defeat "all they have fought for in developing inland waterways." Also, the witness opposed discontinuance of the Federal Barge Line because he feels that the "pioneering work" should be continued "for a while longer."

Representative Mapes, Republican of Michigan, wanted to know how long the country would have to wait for the Federal Barge Line to complete its job of demonstrating; and the witness thought that it wouldn't be long if private investors who "have been showing an interest" could be put "at ease" by assurances that there is to be no regulation of water carriers. At another point Mr. Feltus contended that rather than regulate water carriers Congress might prohibit railroads from attempting to meet water competition, it being his theory that Congress, having provided the waterways to give the people "cheap" transportation, might well protect that set-up rather than to impose regulations which would tend to raise rates. Previously Representative Martin, Democrat of Colorado, had broken in to declare that the "gigantic" rivers and harbors bills of recent years "tell the story of cheap waterway transportation." The Coloradan calculated that during the past six years Congress has appropriated "over a billion dollars" for rivers and harbors; and he thinks that person "was right" who said that "we could built a four-track railroad from Omaha to Kansas City and save money" as compared with the cost of maintaining "even a flat-bottom-boat channel" in the Missouri. Mr. Martin was not saying that waterways haven't been "beneficial," but he was certain they haven't been "economical."

O. S. Barrett, of Cincinnati, Ohio, president of the Mississippi River System Carriers' Association, read a prepared statement "in opposition to the type of legislation represented by the Lea bill and the committee-of-six bill." As he saw the situation, it lay within the committee's power "to destroy the services on our rivers without having accomplished anything constructive in relief of the railroads which are in trouble;" or "to find out just what is the matter with the railroad situation, and to devise the cures." Mr. Barrett did, however, endorse the proposal to repeal land-grant rates, and he thought it "significant" that the Transportation Conference, sponsored by the Chamber of Commerce of the United States, did not recommend legislation to regulate water carriers although they considered such proposals in their meetings.

Suggests "Housecleaning" for Railroads

"The answer to the railroad situation," in the view of Mr. Barrett, "is not regulation and restriction of water carriers, but a house cleaning inside of the railroads themselves. . . . We realize that, until the railroads get out from under the financial clouds, we, the water carriers, are going to be faced with threats of the kind of destructive and unwise legislation now facing us. We, therefore, sincerely and selfishly hope for a solution of the railroad difficulties. Because we know that it effects no cure of Johnny's abdominal pains to give the

castor oil to Willy, we suggest that this committee look into the details of the railroad situation and there find the causes of their pains, and having discovered the nature of the malady, that you take proper steps to effect a cure."

Mr. Barrett closed with a discussion of the inland waterways and national defense, telling the committee that if it would announce "in no uncertain terms that you would protect these rivers from unwise laws. . . ." it could be assured that "privately owned and privately operated equipment, soundly, intelligently, and privately financed, will be available to serve our country either in peace or in war."

Asked by Representative Halleck, Republican of Indiana, how rates of inland water carriers were fixed, Mr. Barrett replied "by the economic law of supply and demand." He told the same questioner that the operators had been able to develop satisfactory rates without government intervention; whereupon Mr. Halleck asked if the witness would object to removing all regulation from the railroads. Mr. Barrett replied that he would be in favor of "anything the public interest calls for." Mr. Halleck did not think that answered his question, but the witness said it was the best he could do.

Further testimony on behalf of the Mississippi River System Carriers' Association was offered by its counsel, Herman A. Bayless, who supplemented Mr. Barrett's presentation and also discussed the bases of the Association's opposition to specific provisions of the Lea bill and the committee-of-six bill. He had been unable to study the latter in detail but a cursory examination disclosed "many drastic and discriminating provisions, some of which were not mentioned by counsel for the railroads in his detailed presentation before this committee." Mr. Bayless referred "especially" to the proposed rewrite of the so-called commodities clause. "This provision," he said, "would prohibit all the private industrial water carriers on the Great Lakes, inland rivers, coastal and intercoastal waters and the high seas which now transport cheaply, in the public interest, in their own vessels their products such as ore, coal, steel and oil. It would also prohibit the operation of private motor carriers which transport in the service of the public all the great variety of commodities including farm products, not consumed by them."

Can't See I. C. C. as Water-Rate Regulator

John H. Ross, president of the Inland Water Petroleum Carriers Association, comprised of operators on waterways tributary to the Atlantic, filed for the record a statement which he highlighted in brief testimony. He was opposed to both the Lea bill and the committee-of-six bill "in their present forms," the "principal reason" for such opposition being the belief that the Interstate Commerce Commission is not a proper body to regulate water carriers.

Herman Miller, secretary and general manager of the Port of St. Paul, took seven-eighths of March 14's two-hour session to read a long prepared statement in opposition to the "main objectives" of the Lea bill and to "most of the proposals" submitted by spokesmen for the railroads. Mr. Miller read a long list of organizations which he said had authorized him to speak for them; included were the Mississippi Valley Association and the Upper Mississippi Valley Association. In opposing the regulation of water carriers the witness stressed also his opposition to any regulation of Wharfingers on inland waterways.

The interests which Mr. Miller represented agree with the National Industrial Traffic League in the latter's opposition to the Lea bill's proposal for a 19-man, three-division I. C. C. They think that any necessary reorganization of the commission can be effected under the regulatory body's present powers in that connection. Mr. Miller said that many years of railroad regulation have not resulted in a scientific rate structure; and he believes that the I. C. C. would relate water rates to rail rates despite any "safeguards" which could be written into a law placing water carriers under the commission's jurisdiction.

Testimony of P. H. Joyce

Aside from the above-mentioned recommendation calling for I. C. C. regulation of the relations between railroads, the statement read by Co-trustee Joyce of the C. G. W. touched upon several other points. As he sees it the solution of the railroad problem "will have to come to a large degree from within;" but he thinks laws might "aid in bringing about conditions that will enable the railroads to help themselves." He went on to discuss what he regarded as a proper regulatory set-up wherein regulation would be "prompt and decisive" with the regulatory body devoting its time to "useful work" without being required "to diffuse its energies in dealing with too many things out of which little or no public benefit comes."

After discussing briefly "a few simple changes in the law" which should "greatly improve the quality of regulation," Mr. Joyce addressed himself to the proposition that "rates and wages must go together." In this connection he asserted: "If wages go up rates have got to go up at the same time. Otherwise all the railroads can do is to lay off men and reduce employment, which hurts everybody." Passing quickly over citations of a need for repeal of the long-and-short-haul clause and for amendments to the law dealing with reparations Mr. Joyce came to his discussion of the relations between railroads. That section of his statement reads as follows:

Relations Between Railroads

Regulation of the relations between the railroads, and between railroads and other carriers, is necessary if we are to have a vigorous and healthy transportation machine. The railroads ought to be able to regulate their inter-relations themselves but they seem unable to do it.

In 1934 the railroads set up an association for this purpose but it has never functioned to do these things. Probably this is because the association is controlled by a few railroads with selfish interests to serve. There can be no well developed transportation system if a few of the big roads are well nourished while the rest of the roads starve to death.

The law gives the commission many powers to regulate such matters as through routes and joint rates, divisions, switch connections, car service, compensation for use of cars and locomotives, joint use of terminals, combinations and consolidations, but these powers are infrequently exercised and if one or a few railroads try to invoke them there seems to be a strong resistance to do anything. This is probably unavoidable in view of the many duties delegated to the Commission and the great amount of work required of it, but it does entail delays that we think could be reduced if the burden of work were lightened in some of the ways we have suggested.

Most of the traffic of the country moves over two or more railroads, and a lot of it requires refrigeration and other special services, and the use of cars controlled or owned by one or a few of the railroads handling it. If all of the railroads are to be fairly supported there has got to be fair and just division not only of the freight rates but all of the other charges that the shipper pays, and some control over the charges that are made for the use of private cars. A very great number of these cars are owned by car companies that are controlled by just a few railroads and in this way they extract from all the

other railroads a great amount of money which seems entirely beyond the benefit derived from the use of the cars. The commission now has the power to regulate these things but they seldom do it.

When we went into the Association of American Railroads we deluded ourselves with the hope that something would be done about these things, but it soon became evident that the roads benefiting from these practices are in the saddle and are not going to permit anything to be done to remove the advantages which they enjoy.

The Association of American Railroads has failed to bring about any improvement in the railroad situation. This is probably because the majority of the men who sit on its board of directors and on its executive committee have too many interests that prevent them from acting to straighten out the affairs of the railroads.

The Interstate Commerce Commission has plenty of power to do these things but is not required to exercise this power except as it may decide to do so. The solution of the problem as we see it is not in giving the commission greater authority but a suggestion or direction from Congress to exercise the authority it now has to remove injustices and bring about proper conditions within the railroad industry.

It seems very clear from the experience of the past few years that the railroads are not going to straighten out their troubles through any organization they are able to set up for themselves. The commission has got to do it for them. All that is necessary is that Congress make it clear that the commission is expected to do it and they will promptly take hold of the job and do it well.

The railroads will still have to face the lack of sufficient business, but they will be in a stronger position to do what they can to increase their traffic and thus add to their earnings and their ability to purchase material and employ men.

The purchasing power of the railroads of the middle west is at a standstill. They ought to be spending a great deal more than they are, but they haven't the money and consequently are not able to employ as much labor as the country has a right to expect them to.

Lending money to the railroads is not going to help. It simply piles up debt on which they have little or no prospect of being able to pay even the carrying charges. The situation is not going to improve until they are able to earn more money and when they can do this they should be able to secure all the credit they can make good use of. Easy money is just as bad for a corporation as for an individual. If it can be had with little effort it is quickly spent without much thought of the day of repayment. If less thought were given to finding new ways to borrow money and more effort made to straighten out the railroad industry so that it can actively go after and develop the traffic it needs, most of the troubles that now confront us would disappear.

From the foregoing Mr. Joyce proceeded to discuss the cost of maintaining the railroad right-of-way, pointing out that other transport agencies "have the use of their right-of-way without expense to them." If the latter policy is going to continue he thinks "we cannot ignore the problem of maintaining the railroad right-of-way;" and thus he suggested that the government might assume 25 per cent or $125,000,000 of the yearly $500,000,000 which the railroads ought to spend for maintenance. Such action by the government, he added, "should be entirely free of any commitment of government ownership or operation, but ought to be under strict supervision to see that the money was efficiently spent and went entirely for labor and materials." In closing Mr. Joyce made a brief reference to the Federal Barge Lines, recommending that such operations as a government enterprise be stopped.

At the March 15 session the committee heard C. A. Newton, general counsel and chairman of the executive committee of the Mississippi Valley Association; Edward Clemens, vice-president of the Mississippi Valley Barge Line Company; and Harry C. Ames, Washington, D. C., attorney who appeared as counsel for that company. Mr. Newton was opposed to regulation of water carriers and to the charging of tolls for the use of inland waterways. With respect to the latter he asserted that the "public" built the "water highways" with the idea of getting "cheaper" transportation rates; and now the advocates of the tolls want "to come along and make the public pay again." Previously Mr. Newton had said that many manufacturers with options on sites along the Mississippi have been holding off on factory-building plans because of apprehensions over the threat of legislation to regulate water carriers.

Representative Mapes, Republican of Michigan, asked the witness to comment on a letter which he had received from an oil jobber who complained that big oil companies use the waterways but still include rail freight rates in their prices. "Cheap water transportation is a joke," Mr. Mapes read from the letter. "All the independent jobber gets from it is a chance to pay tribute to big oil companies at a rate of $150 a car." Interpreting the foregoing to be a claim that the consumer does not get the benefit of "cheap" water transportation, Mr. Newton said that such was not the case so far as M. V. A. has been able to learn. Later Chairman Lea offered for the record a letter from an oil company which discussed the question.

Great Fellows—Those Army Engineers

Continuing, Mr. Newton paid tribute to the army engineers whose work he has found to be in the "public interest;" and he thinks that it would be a "tragedy to the public interest" to supersede these engineers with some "untried body" vested with power to pass on the need for waterway projects. "We don't want to hurt the railroads," Mr. Newton said in closing, "but when they're hurting us we are going to defend ourselves. And the program proposed here means irreparable injury to the interior of the country."

The Mississippi Valley Barge Line Company, Mr. Clemens said, favors the regulation of water carriers by the I. C. C., provided contract as well as common carriers are regulated. Most of his company's charges, the witness went on, are already under federal regulation—this being true of the joint rail-water rates and the joint rates with other water lines. Mr. Clemens was, however, opposed to tolls, although he left the detailed discussion of that matter to Mr. Ames. Meanwhile the former had explained that his company and the Federal Barge Line are the only two common carriers on the Mississippi. The Mississippi Valley Barge Line carried 430,000 tons last year; its investment is $3,500,000, mostly in floating equipment.

Before getting into his discussion of tolls Mr. Ames made a general reference to the committee-of-six bill, saying that in the opinion of himself and his client Congress or the I. C. C. should make any codification of the Interstate Commerce Act which may be necessary; they don't think it proper that such a job should be done by a group composed of railroad people alone. Among other arguments in opposition Mr. Ames contended that it was unfair to propose tolls for inland waterways and to exempt harbors. The improvements on the channels, he went on, would be of no benefit without the "large expenditures" on harbors.

He suggested that Congress is going to keep the present channels open anyway, and thus the present toll-free policy should be continued with respect to them. As to future projects Mr. Ames can see "some merit" in the suggestion that some board — whether it be the army engineers or not — be given power to say whether or not a stream should be improved for navigation. Mr.

(*Continued on page 467*)

Uses Auto-Railer to Advantage

SINCE May, 1936, the Chicago, Attica & Southern has operated auto-railers in revenue service on its line. The first of these rail-highway units was more or less of an experimental model, and the results of its initial operations were described in the *Railway Age* of September 26, 1936, page 453. For the last several months, however, the operations have been conducted with the latest design.

This auto-railer locomotive is of streamlined design, powered by a 110 h. p. gasoline engine with five speeds forward and reverse, the speeds being equal in both directions. It is equipped with four flanged, rubber-cushioned steel wheels, two front and two rear, which serve only as pilot wheels when the car is being operated on the rails. Drive and braking are effected entirely through four pneumatic-tired front and rear wheels, which carry more than 75 per cent of the load on the rails. The pneumatic-tired driving wheels provide a large co-efficient of adhesion on the steel, and permit greater use of the weight of the unit on the drivers for tractive effort. The flanged wheels are retractible, permitting the unit to travel on the highways on the rubber-tired wheels only. The unit weighs 15,290 lb., but despite its relatively low weight, it has a rating of 1,600 gross tons, with a drawbar pull of 10,000 lb. in first gear. Standard automotive plant, transmission, axles, etc., are used and the unit can be serviced by any qualified automobile mechanic. The body is of all-steel construction, with safety glass in all windows, a complete heating and ventilating system, grab handles and steps, regulation foot boards, railing mirror, rear view mirrors, classification lamps and power headlights. The unit is manufactured by the Evans Products Company of Detroit, Mich., and the body by the Baker-Raulang Company of Cleveland, Ohio.

Operating Results

The Chicago, Attica & Southern is a portion of old main line of the Chicago & Eastern Illinois, that was purchased by local farmers and tradespeople in 1921 after it had been abandoned for a year by the former owners. It runs north and south between West Melcher, Ind., and Wellsboro, crossing numerous east-west trunk lines, and a large portion of its carload freight is "bridge" business, handled from one of these trunk lines to another. The auto-railer is used largely on the northern portion of this line and particularly on a 21-mile branch between Percy Junction and State Line Junction.

Actual costs show that the unit operates for approximately 25 cents per mile, or $1.82 per hour, excluding the operator. The following is a typical two weeks' operation:

Mileage operated	658	
Daily average	59.8	miles
Daily fuel consumption	25	gal.
Cost	13	cents per gal.
Revenue ton miles	12,985	
Empty ton miles	7,917	
Total gross ton miles	30,458	
Average speed	24.8	m. p. h.
Total time in service	69	hr.
Time handling merchandise	2	hr. 58 min.
Switching time	27	hr.
Waiting connections	6	hr. 8 min.
Waiting loading	1	hr. 18 min.
Loaded cars handled	41	
Empty cars handled	33	
Gross tons	2,573	
Cost per hour	$1.82	

The auto-railer is called into service for a wide variety of duties. Recently, 14 loaded cars were set on an interchange track at La Crosse near the north end of the line after the daily steam train had left. The nearest extra locomotive was at Attica, 62 miles away, which, taken in conjunction with the fact that there is no water tank at La Crosse meant that the crew could not get out with the locomotive and back to Attica with the 14 cars within the 16-hour limit.

Variety of Uses

The auto-railer was working on the branch at the time, and was sent over the highway to La Crosse, where it picked up seven of the cars and hauled them to Wheatfield, 20 miles from La Crosse, where a water tank is located. It then returned to La Crosse and brought the other seven cars to Wheatfield. Meanwhile the steam locomotive had arrived and it took the entire train to Attica, where the necessary connection was made well within the 16-hour limit.

On another occasion a bridge burned just south of Wheatfield, cutting the northern end of the line in two.

The C. A. & S. Uses Auto-Railer for a Wide Variety of Service

During the rebuilding of the bridge, the regular daily steam train was operated between Perry Junction and Morocco, where connection is made with the New York Central, over the branch. This left the main line between Percy Junction and Wellsboro without service and broken in the middle. The auto-railer provided this service by working south of the burned bridge, then using the highway to get around it and returning on the rails to work the north end.

The cab of the auto-railer will accommodate eight men and considerable material and the unit is much used for work train service and for distributing grain doors along the line. It also frequently aids the steam train in station and interchange switching. Recently, when two box cars were derailed, it served as a wrecker, with the ability of getting out on the highway on the side of the wreck away from the rails when a pull in that direction was necessary to disentangle the wreckage.

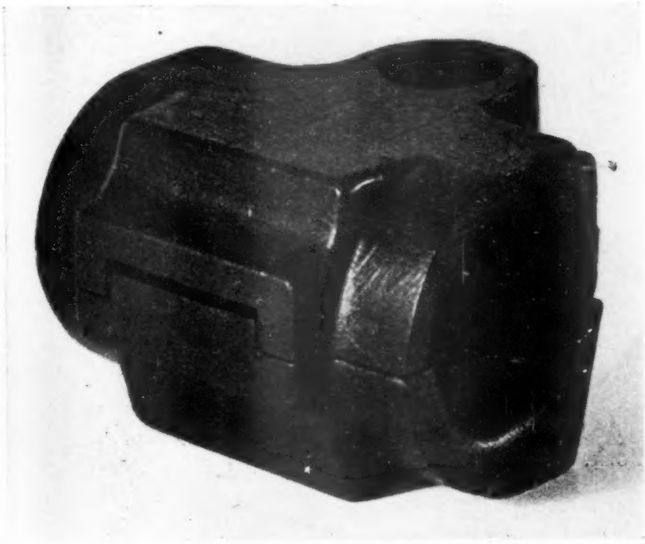
Since the installation of the auto-railer, merchandise and carload traffic has increased materially because of

the service now available that could not be given by the more expensive and less flexible steam train.

The auto-railers are equipped with Goodrich 32 by 6 heavy-duty tires of the non-skid type. The tread vents drain the water from the rails and provide dry traction.

T-Z Brake Hanger Wear Blocks

THE T-Z Railway Equipment Company, Chicago, has recently brought out and placed on the market a pair of wear-resisting blocks for use in connection with the brake-beam hanger brackets of railway car trucks. The object of these wear blocks is to relieve the hanger brackets of direct wear by the link hangers supporting the brake beams. These blocks are designed, as regards size and shape, to fit into the truck side bracket approved by the A. A. R. Committee on Brakes and Brake Equipment and to be secured within the



Brake Hanger Wear Blocks Developed by the T-Z Railway Equipment Company

recess of the bracket by the method recommended by that committee.

In order to give long service the blocks are made of cast steel and with strength sufficient to withstand the alternate stresses imposed by the link hangers in service. They may be readily removed from their recesses in the pockets of the hanger brackets which form an integral part of the truck side frame.

The blocks have large bearing surfaces to minimize the wear on the truck hanger brackets. The lower one has a full half circle bearing surface for the link hanger in order to decrease the tendency of both block and link hanger to wear. The upper one has clearance to permit oscillatory movement of the link hanger, and to prevent binding of hangers and blocks, at the same time providing adequate resistance and strength against upper thrust during the operation of the brakes.

To keep the blocks in alignment they have a male-and-female joint arranged at right angles to the bearing surfaces for the link hangers and, as they bear against the semi-circular part of the bracket recesses and with the retaining bolt fully surrounded by both the blocks, movement in any direction is rigidly resisted.

Chicago Great Western Raps A. A. R.

(*Continued from page 465*)

Ames told Representative Holmes, Republican of Massachusetts, that one "good feature" of the bills before the committee was the proposal to give the I. C. C. authority over the minimum rates of all transport agencies.

Making his maiden speech in the House on March 14, Representative Gerlach, Republican of Pennsylvania, offered 10 suggestions which he believed would "bring about economic recovery in this country and in the world." No. 8 was "Railroads" in which connection Mr. Gerlach said in part: "Much favoritism now exists, and to a pronounced degree in the important matters of regulation, taxation and subsidies. While substantial relief should come with improvement in general business the removal of all favoritism and inequalities is essential to the healthful functioning of the transportation industry. Certain temporary measures are necessary and should be adopted, but the only way by which anything of lasting benefit can be accomplished is by equalizing all modes of transportation with respect to the three important matters mentioned."

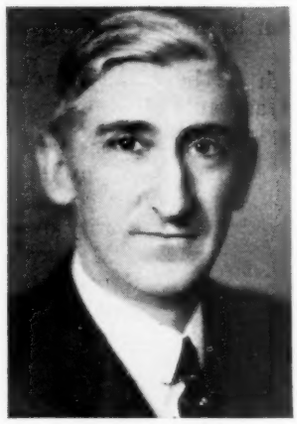
"Progress" on Wheeler Bills

Chairman Wheeler of the Senate committee on interstate commerce was at the White House for another purpose on March 15, but he told newspapermen that he had also discussed the railroad problem briefly with the President. He said that he had told Mr. Roosevelt that progress was being made on the bills which the Montanan plans to introduce in the Senate. As indicated previously these will cover, among other things, the regulation of water carriers and railroad reorganization procedures. Mr. Wheeler expressed the view that it would be more feasible to embody transport legislation in several measures since an omnibus bill always brings forth different opponents to its several sections. He indicated that he would oppose any omnibus bill which called for repeal of the long-and-short-haul clause.

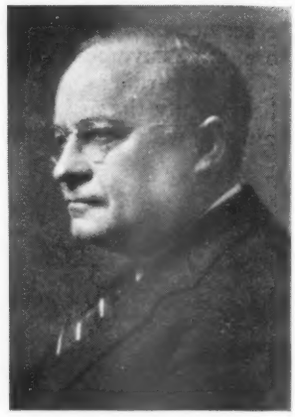
William C. Dickerman, president of the American Locomotive Company, was also a White House caller on March 15. He did not reveal the nature of his conversation with the President but did comment briefly on the railroad situation. The sooner the railroad problem is solved, Mr. Dickerman said, the better conditions generally will be. Among the beneficiaries, he added, will be the railroad equipment industry. He pointed out that the carriers are among the country's largest purchasers with the result that "a healthy state for them means good conditions for all."

RECIPROCAL ADVERTISING RELATIONS with manufacturers were undertaken in connection with publicity on the "Flying Ranee" of the Bombay, Borada and Central India Railway, according to the report of the Railway Board on the Indian Railways for 1937-38. Industrial firms were permitted to distribute samples of their products to passengers traveling on the Flying Ranee on different Saturdays during the year and in turn the railroad undertook to advertise the fact widely free of charge to the manufacturers. Also in connection with the inauguration of the train, a four-color match box label was prepared with a picture of the "Flying Ranee" crossing the so-called Bassein Bridges, and placed on match boxes widely distributed throughout India. The Madras & Southern Mahratta has negotiated a reciprocal arrangement with the Indian Postal department whereby railway publicity posters and pamphlets are displayed at postal and telegraph offices in exchange for similar facilities for postal advertisements at railroad stations.

F. E. Morrow
President



E. M. Hastings
President-Elect



G. S. Fanning
First Vice-President

A.R.E.A. Has Successful Meeting

Fortieth annual convention, involving three-day program, was marked by intensive activity in the interest of greater efficiency and economy

GETTING under way with a spirit of optimism for a more favorable railway year ahead, with the increased activity that this will mean for railway engineering and maintenance officers, the American Railway Engineering Association held a highly intensive and constructive annual meeting in Chicago on March 14, 15 and 16, with more than 1,029 members and guests in attendance from all parts of the United States and Canada. Generally, there was a feeling of encouragement as railway net operating income in recent months has shown a marked increase over that for corresponding months of a year ago, and as budgets have been expanded on most roads to permit the carrying out of enlarged work programs and the purchase of additional work equipment.

It was the fortieth annual convention of the association, and as for a number of years in the past, it was held at the Palmer House, with two general sessions on Tuesday, Wednesday and Thursday for the presentation and discussion of committee reports and the transaction of association business. This year 27 standing and special committees presented reports on a wide range of subjects of interest to railway engineering and maintenance officers, which again indicated the growing interest among railway men in research and field testing and the continuing determination on their part to find the most effective and economical solutions of the problems confronting them.

Features of the program were an address by J. W. King, vice-president, Operations and Maintenance department, Association of American Railroads, who spoke of the enviable record of achievement of the association and of the further opportunities which lie ahead of it; the association luncheon on Wednesday, with 805 present, which was addressed by C. E. Johnston, chairman, Western Association of Railway Executives; an illustrated talk by C. E. Smith, vice-president of the New York, New Haven & Hartford, on the ravages of the New England floods and hurricane last September, and the work of rehabilitating the railways; and the joint dinner-meeting with the Western Railway Club on Wednesday night. This latter meeting, held at the Hotel Sherman with more than 1,000 in attendance, was addressed by H. R. Clarke, engineer maintenance of way, Chicago, Burlington & Quincy, and Kenneth Cartwright, mechanical engineer, New York, New Haven & Hartford, on "The Relation of Locomotive Design to Rail Maintenance." Coupled with the activities of the convention proper was the exhibit of equipment and materials presented by the National Railway Appliances Association for the second year at the International Amphitheatre, as reported elsewhere in this issue.

All general sessions of the convention were presided over by President F. E. Morrow, assisted by E. M. Hastings, vice-president, and W. S. Lacher, secretary. According to the report of the secretary, the receipts of the association during the last year exceeded expenditures by $3,181.57, and the membership as of March 1, 1939, totaled 1,920. The registration at the convention was 667 members and 362 guests, a total of 1,029, as compared with a registration of 687 members and 400 guests, a total of 1,087 last year.

At the concluding session on Thursday, the following officers were elected for the ensuing year: President, E. M. Hastings, ch. engr., R. F. & P., Richmond, Va.; second vice-president, F. L. C. Bond, vice-pres. and gen. mgr., C. N. R., Toronto, Ont.; directors, Robert Faries, asst. ch. engr.-maint., Penna., Philadelphia, Pa.; G. R. Smiley, ch. engr., L. & N., Louisville, Ky.; and J. B. Akers, asst. ch. engr., Sou., Washington, D. C. Members Nominating committee: H. M. Church, gen. supv. b. & b. C. & O., Richmond, Va.; Elmer T. Howson, western editor, *Railway Age*, Chicago; G. F. Hand, gen. asst. engr., N. Y. N. H. & H., New Haven, Conn.; G. H. Trout, bridge engr., U. P., Omaha, Neb.; W. B.

Irwin, asst. to vice-pres. operation, G. N., St. Paul, Minn. In addition, G. S. Fanning, ch. engr., Erie, Cleveland, Ohio, was advanced automatically to senior vice-president of the association.

On Tuesday afternoon, C. E. Smith (N. Y. N. H. & H.) presented a highly interesting and dramatic description of the New England floods and hurricane of last September, giving many details of damage done and of the speed of rehabilitation (this storm and the manner of rehabilitation were described in the *Railway Age* of October 1, 1938, page 472). Mr. Smith's address was illustrated with a number of slides.

President Morrow Reviews Work of Year

In opening the convention, President F. E. Morrow (chief engineer, C. & W. I.-Belt railways) reviewed the progress of the organization during the last year. Dwelling especially upon the objectives of the association, Mr. Morrow defined them as (a) the collection and dissemination of information designed to improve materials and methods in the construction and maintenance of the railroads, and (b) aiding in the development of individual members of the engineering staffs of the railroads. "One of our major activities," he said, "is the constant survey of our fields of activity in order to keep our membership abreast of developments. Our committees are maintained for this purpose. It is their function to separate the wheat from the chaff and formulate our recommended practices.

"Another important activity of ours is the carrying on of original research work. These activities have resulted in important discoveries and improvements in practices. It is our expectation that others which are in process will likewise result in important improvements. There are many other fields available for profitable exploration through research projects and it is our hope and expectation that these will be carried on just as fast as funds are available for them."

Elaborating on the second objective, Mr. Morrow pointed out that contact with other engineers enlarges the horizon of each individual and acquaints him with many ideas and practices which would not be available to him when engaged solely in his own individual work.

J. W. King Addresses Convention

Following Mr. Morrow's address, J. W. King, newly-elected vice-president, Operations and Maintenance department, A. A. R., addressed the association, pointing out that the primary function of the A. A. R. in its relations with the A. R. E. A. is to co-ordinate its activities with those of other divisions of the A. A. R., looking to the progressive improvement of the railways as a transportation agency. The A. A. R. is also able, he said, to bring to the attention of the A. R. E. A. problems which railway managements believe to be of vital concern and to act as a clearing house through which engineering officers can represent the railways in negotiation with public authorities. The value of the A. R. E. A. to the A. A. R. is attested, he said, by the fact that the A. A. R. has appropriated $80,000 this year for various research projects of the Engineering division, including its share of its operating expenses.

"In spite of your record of achievement," Mr. King continued, "I would like to ask a few questions regarding your activities. Are you giving attention to the problems of greatest concern to the railroads? Are you attacking them with a thorough understanding of just what is needed? Are the results of your studies presented in a form that will make them most useful to the men who have the most urgent need for the information you have developed and the conclusions which you have reached? Are your investigations made and conclusions reached without unnecessary delay? Through these questions, it is my thought to direct your attention to the fact that the necessity for improvements in methods does not become apparent unless one is on the lookout for them."

"I am told," Mr. King said in conclusion, "that the question most frequently raised concerning your Manual does not relate to its technical merits but to the fact that its contents are not more generally adopted by the railroads. Possibly the valid application of this is to be found in the title, 'Recommended Practices,' rather than mandatory standards. I recognize also that the value of the Manual is not to be measured solely by the extent to which the specifications, plans, rules, etc., have been adopted in their entirety by the various railroads because of the wide use that is being made of them as guides in the drafting of similar and somewhat modified instruments for the same purpose."

Address by C. E. Johnston

A searching analysis of the present predicament of the railroads and of the extent to which it has been caused by unfair and subsidized competition was presented by C. E. Johnston, chairman, Western Association of Railway Executives, in an address at the annual luncheon of the association on Wednesday. Mr. Johnston expressed the belief that the greatest fundamental difficulty of the railroads is the need for more traffic. The railroad industry is suffering, he said, from malnutrition, brought about largely by unfair competition, supported more or less by government. If a sound and fundamental balance of the controlling economic factors was allowed to prevail, he feels that there is at the present time a much greater volume of traffic available that would flow to the railroads.

Mr. Johnston presented various estimates of the amount of traffic being handled by trucks on the highways and, on the basis of these estimates, he concluded that the total freight traffic handled annually by the railroads and the trucks produce revenue of approximately $5,500,000,000 under existing business conditions, of which the railroads now get about 63 per cent. The trend of this percentage is downward, he said, and will probably continue in that direction until a real effort is made by the government and the states to apply sound, impartial economic principles in the field of transportation.

While airways, waterways and buses account for a large volume of traffic, it is generally conceded that the highway motor truck is the most damaging competitor of the railways. The research department of the Western Association of Railway Executives estimates that each year the railways lose traffic to trucks that, if carried by the railways, would produce additional revenue of nearly $2,000,000,000. It seems difficult for even our own railroad people to realize and grasp the full extent to which this competition has grown during the last few years and to understand that unless something is done quickly to stop the present trend, the railroad industry, as a privately-owned and operated institution, is doomed. This situation has been permitted to grow worse until the time has arrived when only through organized, concerted and honest effort and action may we expect to

save the industry and our people from government ownership and operation. It is significant to note that it is in the high-rate classifications that the railroads experience the devastating inroads of truck competition.

We must realize, Mr. Johnston continued, that government regulation of the railroads is based on the theory that the carriers enjoy a monopoly but that such monopoly no longer exists and, second, that the railroads' competitors depend for their existence on the use of the thoroughfares provided at public expense, which were constructed primarily for use by passenger automobiles and for farm-to-market service and the local distribution of goods. Mr. Johnston then proposed six statements that "our friends in the highway transport field should agree with."

1. Those who use highways for the long-haul transportation of freight should pay their fair share of the capital cost of construction of roads and of the current cost of maintenance.
2. That they should make their proper contribution to the general expense of schools and other functions of government.
3. That they should not use vehicles unduly destructive to the roads over which they operate.
4. That they should not conduct operations which are unduly hazardous or which unreasonably interfere with highway use by passenger cars or those in local farm-to-market service.
5. That they should not conduct operations which are unnecessary and which so add to the existing surplus in transport facilities as to be inconsistent with the public interest.
6. That laws pertaining to these subjects should be enforced with some reasonable degree of efficiency.

The responsibility for this situation, he said, lies not alone with the Federal Congress but rests to a large extent upon the shoulders of the states. In only a few states, he asserted, is there any approximate knowledge of the actual yearly cost of public highways or of the fair apportionment of their cost among the vehicles which use them. In the few states where knowledge of these basic facts exists, he continued, tax charges levied against individual vehicles do not bear even a remote relation to the proportion of highway costs which they should bear.

He then referred to the recent study in the state of Illinois, showing that the state incurs an annual cost of $1,361.28 for a heavy-duty truck and collects from that same vehicle $364.56 in all kinds of fees. Such payments as are made by the trucks, he said, are not taxes at all but are merely inadequate contributions towards the enormous expense of providing special facilities (highways) for the special use of trucks. It is his belief that if the several states and the federal government can be prevailed upon promptly and impartially to equalize the competitive factors, there would be returned to the railroads of the country from one-fourth to one-half of the traffic now moving by truck. Mr. Johnston then outlined a program for correcting the situation, saying that in such a program railroad transportation must be sold to the public by arguments that must carry the conviction which springs from "honesty, simplicity, directness and understanding."

Report on Standardization

E. M. Hastings, Chairman*

This committee reported progress on all three of its assignments, namely: (1) What A. R. E. A. recommended practices should be advocated for general use on railroads; (2) What A. R. E. A. recommended practices should be sponsored as projects for National Standardization; and (3) Maintain contact with standardization bodies and keep the association informed on important matters developed by such contact.

Under the first assignment the committee reported that, because of the small number of changes that would be made in the tabulation of items previously selected by the committee as worthy of careful study by members of the association, it was of the opinion that re-publication of the list was not warranted. The committee again suggested to the members that a study of the recommended practices and specifications, as set forth in the tabulation, is worthy of careful consideration. It also directed attention to the few changes in the Manual that have been made since publication of the list.

Regarding its second assignment the committee reported that it has not recommended any projects during the past year nor does it have immediately before it any projects to recommend. In reporting on the third assignment it stated that contacts with standardization bodies had been maintained as heretofore and presented a brief resumé of the activities of the American Standards Association and of the Canadian Engineering Standards Association. Again this year it did not present a list of the standards approved by the A. S. A. during the last year, or a tabulation of A. S. A. technical projects on which the Association of American Railroads is now co-operating.

Supplementing the written report, Chairman Hastings spoke of the extensive information of value to the railways in the Manual of Recommended Practice of the association and urged that greater consideration be given by members to the study of this material and to the adaptation of it to the particular requirements of their roads. The report was received without further discussion.

Waterways and Harbors

G. P. Palmer, Chairman*

This committee reported progress on six of its assignments and presented reports on two, namely, Revision of the Manual and on warehouse, coal, car float and other piers on the Great Lakes and sea coasts.

Revision of the Manual

The committee recommended minor revisions in the material in the Manual under Clearances for Structures Over Navigable Waters, and Allocation of Expense for the Construction, Maintenance and Operation of Bridges Over Navigable Waterways. Altogether five changes were recommended in this material, including four insertions and one deletion.

These revisions were approved.

Warehouse, Coal, Car Float and Other Piers

At the outset the committee stated that its report on warehouse, coal, car float and other piers, was intended to cover only the general features encountered in the design and construction of coal piers. Mechanical features, track layouts and other phases of the subject, it pointed out, have been covered in some detail in a previous report of the Committee on Yards and Terminals.

Much of the report was devoted to a discussion of the features common to coal piers that are found in given sections of the country. Thus, the committee considered separately coal piers at ports in New England, at ports on the eastern and western seaboards, the gulf and rivers, and at ports on the Great Lakes. In each instance the various existing types of piers were described, prevailing dimensions were given, the salient features of a number of individual piers were discussed, and features of construction were described. As examples of modern pier design and construction, the committee described in some detail the coal pier of the Norfolk & Western at Lambert Point, Va., and also that of the Wheeling & Lake Erie at Huron, Ohio.

In a general discussion of coal piers, the committee reviewed its findings on the subject. It pointed out, for instance, that berthing space is not always restricted, being available in many ports for the entire length of the pier and in some instances on both sides. Observing that fire prevention and protection are important at every pier, the report discussed different methods that are in use for furnishing this type of protection. This phase of the report also discussed the relative costs of timber

* Chief Engineer, Richmond, Fredericksburg & Potomac.

* Engineer Maintenance and Construction, Baltimore & Ohio, Chicago Terminal.

and concrete bulkheads, and considered briefly the service life of timber coal piers.

In its conclusion the committee said that the design of coal piers is more or less individually determined by local requirements, and that the substructure must be planned in accordance with local conditions and for loads heavier than are encountered in the common design of piers. This report was submitted as information.

The report was received without discussion.

Report on Electricity

H. F. Brown, Chairman*

In reporting on its assignment to keep the association informed regarding (1) developments in the application of electricity to railway service, and (2) the principal current activities of the Electrical section, Engineering divison, A. A. R., this committee followed its usual practice of presenting a brief synopsis of the reports made by the different committees of the Electrical section at its last meeting. These reports were publishd in full in Bulletin No. 405, dated September-October, 1938.

Under its first assignment, the committee directed attention to the extension of electrified trackage on the Pennsylvania westward to Harrisburg, Pa.; the acquisition of new electric locomotives by the Pennsylvania and the New York, New Haven & Hartford; further developments in electronic rectifying apparatus for converting alternating current into direct current; development of the "gene-motor," or motor-generator set, for application in connection with air-conditioning and the use of electric power on passenger cars; recent developments in the field of electric illumination; the increased use of Diesel-electric motive power; the increased application of electric welding in car construction; and the fact that an eastern road has installed an experimental section of track in which the joints are electrically welded.

Subjects reported on under the second assignment were as follows: Power supply; electrolysis; overhead transmission line and catenary construction; standardization of apparatus and material; electric heating and welding; application of motors; clearances for third-rail and overhead working conductors; protective devices and safety rules in electrified territory; specifications for track and third-rail bonds; illumination; and application of corrosion-resisting materials to railroad electrical construction.

The report was accepted without discussion.

Economics of Railway Location and Operation

H. M. Stout, Chairman†

The committee presented progress reports on 9 of its 13 assignments, reported progress in study on two others, submitted a final report on one assignment which it recommended be received as information, and offered material as information under Revision of the Manual.

Revision of the Manual

Explaining that, in practice, locating and operating engineers are often handicapped in making comparisons of the economic value of various locations and gradients because of the lack of essential data regarding locomotives and also because of the involved nature of the computations, the committee reported that, to simplify the calculations, a number of tables and forms or "work sheets" have been developed for obtaining the speed curves of various locomotives. Samples of these forms and a number of examples illustrating their application were given in the report. To demonstrate the application of theory to practice and to combine the last two reports on this subject, the committee pointed out that in this year's report it was necessary to cover some of the ground that has been covered before.

The committee's report on this subject was divided into three parts, the first being comprised of definitions of terms used in the report, while the other two parts consisted of discussions of steam and electric locomotives, respectively. Under steam locomotives, the committee submitted a table listing 55 possible designs of steam locomotives grouped according to their wheel arrangements and showing how the weight of each engine is distributed. Another table gives the approximate horsepower capacities per ton of the weight on the drivers corresponding with various ratios of the weight on the drivers to the weight of the engine and also with the types of engines available.

As an aid in computing the speed-tractive effort curves of steam locomotives using superheated steam, the committee submitted two sample work sheets, one for use where design data are not available and the other for use when such data are available. Explaining that the chief purpose of speed-tractive effort and horsepower curves is to provide a basis for calculating the performance and the fuel consumption of the locomotive in service, the committee presented a method for making such calculations.

Under electric locomotives the committee pointed out that there are two general systems of electrification—direct current and alternating current—and presented formulas and sample work sheets for calculating speed-tractive effort and horsepower output of locomotives in each class. Also it presented sample forms of the same type for motor-generator locomotives, a form for calculating the braking effort and output regenerated by direct-current locomotives and a form for calculating the tractive effort and horsepower output of oil-electric locomotives. All methods of calculation submitted for both steam and electric locomotives are illustrated by means of examples.

The committee assumed that the forms, with the examples used, will be sufficient for Manual purposes, and recommended that this report be received as information.

More Intensive Use of Existing Railway Facilities

The committee continued its study of the more intensive use of existing railway facilities and, after reviewing briefly previous reports on this subject, it submitted as this year's report a discussion of the possibilities of the coordination of facilities. First the committee traced the history of the joint use of facilities, pointing out that 5½ per cent of all "first track" and 8 per cent of "all other tracks" were jointly used in 1923. As a result of the precipitous drop in carloadings that occurred during the depression, said the committee, the joint use of facilities became a problem of the co-ordination of competitive facilities and services for the purpose of making possible the retirement of excess facilities and a reduction in costs as a result of consolidated operation.

The report then commented on the work of the Federal Co-ordinator of Transportation, pointing out that the Emergency Railroad Transportation Act, which created the position of Co-ordinator, contained a provision [Section 7 (b)] that the number of employees in the service of a carrier could not be reduced by reason of any action pursuant to this legislation. Brief mention was then made of the so-called Washington agreement between the railroads and their employees, and this was followed by a discussion of the problems that would be involved creating a "universal terminal."

The committee then commented at length on the influence of property rights in the consolidation of terminal properties and also discussed briefly problems incident to the loss of traffic advantages that would occur as a result of such consolidations. Section 7 (b) of the Emergency Railroad Transportation Act as a factor in retarding the consolidation of facilities was also commented on.

More Economical and Efficient Railway Operation

In its report on methods or formulas for the solution of special problems relating to more economical and efficient train operation, the committee undertook a study of the economic relation between the track structure and the traffic to be handled. Expressing traffic density in terms of ton-miles per equated mile the committee made a study of section man-hours per million gross tons per equated mile on 93 railroads for the period 1927-36, inclusive. Next it divided these railroads into four groups corresponding to different rail weights, namely, 131-lb., 112-lb., 100-lb. and 90-lb. or less, and tabulated the section man-hours per equated mile, the gross ton-miles per equated mile and the section man-hours per million gross ton-miles per equated mile, averaging the figures for the years 1927-8-9 and comparing them with the figures for 1936.

On the basis of the foregoing tabulations the committee noted

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† Assistant Valuation Engineer, Northern Pacific.

that the section man-hours per million gross tons definitely increase as the rail weight decreases. By means of further comparisons the committee showed that as the weight of rail decreases the ability to reduce labor costs also decreases. The committee also reported that its studies definitely bring out the fact that the reductions in section man-hours from 1927-8-9 to 1936, have not been governed by the use-factor values as set forth in the Manual. Pointing to a large reduction in the actual hours worked as compared with the theoretical hours allowed by formula the committee commented on the various factors contributing to this situation, such as deferred maintenance, elimination of non-essential work, and the effect of track betterment.

The committee pointed out that the use of heavy rail with larger tie plates, treated ties, deeper ballast, the widening of cuts and fills, provision for better drainage and stabilization of the road bed, have permitted changes in organization and methods of handling work that have resulted in substantial man-hour reductions, and that these improvements in track structure have greatly increased the safety factor in the conduct of transportation.

It was also pointed out that this increased safety factor has made it unnecessary to patrol track regularly every day as was the former practice. While this has resulted in large part from better track conditions, other influences have been at work, such as the use of the detector car, increased mileage of automatic signals, the installation of slide-detector fences in cuts, and other similar safety devices. Furthermore, motor cars are now used for inspection purposes, and for the movement of men, resulting in greater mobility of the forces and decreased traveling time. More recently, the use of highway automotive vehicles for transporting men and materials has, in many cases, effected further reductions in traveling time. The committee also pointed out that the growing use of off-track equipment results in less loss by reason of stand-by labor while waiting for trains to pass.

In conclusion, the committee stated that there is a definite economic relation between track structure and traffic density, and offered a formula for determining the justification for improvements in the track structure to meet increased traffic density.

High Speed and Operating Expenses

Pointing out that railway operating expenses are composed of five general accounts, the committee said that only three of them are affected by increased speeds, namely, maintenance of way, maintenance of equipment and transportation rail line. Regarding the first of these, the committee quoted from last year's report of Committee 16 and stated that no additional information had been obtained. Also, in discussing maintenance of equipment expenses, it said that more experience will be necessary before the effects of high speeds can be accurately estimated. To determine the effect of high speeds on transportation rail line expenses, the committee is making a study of train sheets and has also partially completed a tabulation showing tonnage that can be handled by different classes of locomotives at different speeds.

Inland Waterway Transportation

The assignment on the effect of inland waterway transportation on the economies of railway operation comprised a new subject for this committee on which it will make further reports. For this year the report comprised a brief history of the development of inland waterway transportation in the United States as related to the development of railway transportation.

The report first traced the development of canals, and showed how traffic on both canals and rivers was stimulated by the advent of the steamboat. However, rapid expansion of the railroads subsequent to 1860 brought about a corresponding decline in water transportation which continued until the World war. At that time the stimulus imparted by the war started a renaissance which was continued after the war by fostering legislation and the support of many government officials, individuals and organizations.

The report contained many figures and tabulations showing the growth and cost of inland waterway transportation, and quoted extensively from addresses and documents bearing on the subject. A comprehensive bibliography of articles on the subject also formed a part of the report.

Following the presentation of this report, W. J. Burton (M. P.) observed that one of the effects of waterway competition not generally given consideration is that, when the railroads reduce rates to meet such competition, they must of necessity raise rates between non-competitive points, thereby shifting the burden of transportation from one group of shippers to another. F. R. Layng (B. & L. E.) referred to the proposed canal connecting Lake Erie and the Mahoning river and pointed to numerous aspects of this project which the army engineers apparently failed to take into consideration in compiling their recent report. He offered the thought that the supporters of this project might be using it simply as a means of obtaining rate concessions from the railroads in the territory, the basis of this opinion being the statement of the army engineers that the project could not be justified if the railroads lowered their rates 29 cents per ton.

Effect of Rail Oiling on Transportation

In making its first report on the Effect of Rail Oiling on Transportation, the committee reviewed briefly the history of rail oiling, both as a means of combatting corrosion of the rail and fastenings and as a means of lubricating rail on curves. It then discussed briefly the effect of rail lubrication on curve resistance, and stated that further examinations would be made of the possibility of obtaining satisfactory data reflecting on this problem by means of dynamometer cars. The committee also pointed out that material tests have been taken for making laboratory tests bearing on this problem.

Line and Grade Revisions

In reporting on its assignment to compile operating data essential to establish units for making line and grade revisions to meet operating requirements, the committee presented a tabular method of comparing present operating costs on a given district with estimated costs that would pertain after proposed improvements have been made. The main items of expense in the tabulation include the total cost of the improvements, interest on this cost, replacement, transportation, maintenance of equipment, maintenance of way and structures and taxes. Instructions are given for determining the value of each of these items.

Spirals Required for High-Speed Operation

In reporting on the use of spirals in tracks for high-speed operation, the committee first reviewed the history of easement curves and presented data from previous reports of the A. R. E. A. and also from the results of questionnaires presented in the Railroad Gazette, the Railway Age Gazette (both predecessors of the *Railway Age*), and the *Railway Age*. Next it considered briefly the objectives of easement curves in modern practice and then presented five basic formulas for computing transition curves. The derivation of each of the formulas was demonstrated and a number of tables presented giving permissible speeds, lengths of transition curves, offsets for transition curves, and elevations of outer rail for permissible speeds.

In discussing this report Mr. Burton raised a question regarding the use of 57.11 in. in one of the formulas as the distance between points of contact between wheel and rail, but O. E. Selby (C. C. C. & St. L., retired), who presented the report of the subcommittee, said that this figure was used because it resulted in a simplified formula. Mr. Burton also expressed the opinion that there was no particular justification for using the figure of 1¼ in. per second as the rate for running off curve elevation, and thought that this matter should be investigated further.

Railway Electrification

The committee's report on the economics of railway location as affected by railway electrification consisted principally of a tabulation showing principal characteristics of steam railroad electrification in the United States and Canada. This tabulation was compiled by taking certain data from reports of the Railway Electrification committee of the National Electric Light Association and of the Federal Trade Commission and sending them to the railroads to be brought up-to-date as of the end of 1937.

Other Subjects

In brief reports the committee reported progress on its assignments dealing with the effect of volume of traffic on railway operating expenses and with grades and alinement through tunnels. Progress was reported on the assignment dealing with methods for determining the most economical train length, and

on the effects of speeds in excess of 75 miles per hour on the economics of railway location.

Uniform General Contract Forms

W. G. Nusz, Chairman*

In reporting on its several assignments the committee offered no revisions or additions to the Manual, presented as information one tentative form of agreement, and reported progress on two assignments. Regarding its other assignment—that involving a form of agreement with public authorities for highway grade-crossing eliminations or separations—the committee pointed out, as it did last year, that this subject was assigned before the federal government undertook its grade-crossing elimination activities. It believes that no final form can be submitted at this time.

Operation of Commissary and Boarding Outfits

A tentative form of agreement was presented on the operation of commissary and boarding outfits, which contains paragraphs on contractor's control, contractor's employees, camp utensils and bedding, maintenance of camp, conditions of camp upon leaving, charges against company employees, stocking commissaries, meals, alcoholic beverages and drugs, compliance with laws, fire insurance, indemnity, bond, cost to employees, rental and compensations, equipment, light and water, transportation, statement to company (by contractor), company's control, independent contractor, inspection and cancellation.

Progress was reported in the compilation of a form of agreement for commercial signs on railway property and of a lease for air-right developments, and it is expected that both forms will be submitted next year.

This report was received without discussion.

Maintenance of Way Work Equipment

G. R. Westcott, Chairman†

This committee gave consideration to 13 subjects and presented reports on 6, including depreciation of work equipment, methods of keeping data on work equipment, scheduling the use of work equipment, railway-owned automotive equipment, rail saws, and power tools for bridge maintenance. Progress was reported on the committee's other eight subjects.

Depreciation of Work Equipment

As a result of further study of the depreciation of work equipment, the committee reported that it is now of the opinion that further developments are contingent on the establishment of factual data concerning the service life of roadway equipment. As it will necessarily require a number of years to secure this information, the committee saw no advantage of further discussion of the subject at the present time.

Keeping Data on Work Equipment

In reporting on the compilation of data on work equipment, the committee first pointed out that it is desirable to maintain records regarding work equipment for a period sufficiently long to establish such facts as may be essential in governing further investment. Since many considerations enter into the design and use of forms for maintaining such records, the committee reached the conclusion that, owing to the wide variety of machines in service, the report this year should be confined to a single classification of equipment, namely motor cars.

In considering this subject the committee studied about 125 forms of various kinds that are now in use on different railroads. As a result it presented six forms as follows: Motor Car Inspection Report; Monthly Report of Motor Car Operations; Monthly Report of Shop Repairs to Motor Cars; Report of Motor Cars Received and Shipped; and Record of Motor Cars (two forms). These forms, said the committee, were not presented with the idea of securing their adoption as standard but merely to assist those who are interested in, but unfamiliar with, methods and forms now in use. This report was presented as information.

Scheduling the Use of Work Equipment

Stating that the scheduling of work equipment in order to secure maximum output is necessary if full utilization is to be made of the money invested in the equipment, the committee submitted the following list of operations as being typical of those that may be scheduled successfully: Distributing rail; laying rail; picking up rail; changing angle bars; tightening bolts; ballasting track; cleaning ballast; ditching; driving piles; widening banks; welding rail ends; heat-treating rail ends; renewing ties; bonding rail; burning weeds; spraying weeds; scarifying; and discing.

To determine the nature of current practice regarding the scheduling of equipment, a questionnaire was circulated among the committee in which each member was asked to state his opinion as to whether various types of equipment should be assigned on a system, regional or divisional basis or by the supervisor. The results of this questionnaire were given in tabular form.

The remainder of the report consisted of a detailed discussion, based on the practice of a large fully-mechanized railroad, of a plan for scheduling equipment, in which the distribution of men, materials and machines is under the control of one department head. In its conclusion the committee stated that full utilization of the machines available can be secured only by adhering to a schedule based on studies involving inspections and recommendations concerning the work to be done, but such a schedule can be carried out successfully only where the distribution of men, materials and machines is concentrated under the control of a single authority. It was also concluded that such a schedule will simplify maintenance of the machines and that adherence to the schedule will provide an index to the progress of the season's work. This report was submitted as information.

Rail Saws

In its report on rail saws, which was submitted as information, the committee first gave brief consideration to the various methods employed in cutting rails and entered into a detailed discussion of power hack saws. Salient features typical of the different saws available were described and various considerations encountered in the use of different types of power—electricity, compressed air, and gasoline—were discussed in detail.

Considerable attention was accorded the three rail saws that are now on the market, after which the committee entered into a detailed discussion of the characteristics of saw blades. Brief mention was also made of thin grinding wheels, inserted-tooth milling wheels and friction saws for cutting rails.

In its conclusions the committee stated that (1) the actual saving effected by the use of power rail saws is not easily obtained and like many other items of work equipment these saws are responsible for indirect economy that are known to be worth while but cannot be figured accurately.

(2) Their chief value lies in accuracy, safety, dependability and the greater amount of work accomplished.

(3) In any program of track work where time-saving devices are to be considered for their economy and where quality of work, safety and speed are desired, the power rail saw should be included.

(4) It should be recognized that other faster methods of cutting are available which have restricted the use of rail saws primarily to work requiring great accuracy of cut. Further developments should be along the lines of greater cutting speed with the desired degree of accuracy.

Railway-Owned Automotive Equipment

In a brief introduction to this report, which was submitted as information, the committee drew an analogy between the experience of the railroads with highway types of motor equipment today and with motor cars 25 years ago, and gave brief consideration to factors influencing the choice between these two types of equipment. The remainder of the report dealt with the experience with highway trucks of an eastern railway having 142 highway vehicles in service. This phase of the report described the influence which the introduction of these trucks has had on the maintenance organization, contained tabulations of the various

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† Assistant Engineer, Missouri Pacific.

sizes of trucks in use, gave cost data on their operation, discussed practices pertaining to insurance and safety, and contained sample forms used for reporting mileage and performance, results of inspections, and other facts pertaining to trucks. The report also contained a set of specifications for 14-ft. truck bodies.

In summarizing this report the committee concluded (1) that highway trucks, automobiles and other similar equipment are particularly adapted for use in congested territory where there are dense train movements and conveniently located highways.

(2) The sizes of trucks suitable for railway use vary from ½ ton to 3 tons in capacity.

(3) Large trucks with removable seating and body-top arrangement are used to permit the handling of the personnel of large maintenance gangs as well as their equipment and materials.

(4) Small trucks with pick-up bodies are suitable for signal, water service and telegraph maintainers and for other small gangs.

(5) The stores and mechanical departments use trucks of a variety of sizes to advantage, depending on the type of service required. The type of body also varies, depending on the material handled.

(6) The fact that highway vehicles have proved their value in railway maintenance has done much toward removing the prejudice against their use in railway service.

C. E. Smith (N. Y. N. H. & H.) explained at some length the manner in which the New Haven uses automotive equipment in the conduct of track, bridge and building, and water service maintenance. He said that the use of this equipment had demonstrated economies of considerable magnitude and predicted an expansion of its use as railway officers become more familiar with its possibilities.

Power Tools for Bridge Maintenance

Representatives of 16 roads replied to a questionnaire sent out by the committee concerning the number, type and methods of assignment of portable tools and power unit employed in bridge and building service. Replies to this questionnaire, said the report, ranged from those indicating heavy investment in a great variety of power units and tools to reports indicating that a study had only recently been made of economies to be obtained by equipping one or more gangs with power-driven devices.

The report observed that the history of the mechanization on certain lines seems to have dated from the use of tie tampers in track work, and the gradual utilization of the compressors to drive pneumatic tools on large construction or repair jobs. Consideration was given to the various types of pneumatic tools that are available, such as wood borers, nut runners and saws, and the different types and sizes of power plants that are in use were also discussed. In its conclusion, the committee stated that the consensus of reports indicates that further mechanization of all bridge and building work offers worth-while opportunities for increased economies.

R. H. Ford (C. R. I. & P.) commended the studies already undertaken by this committee, but suggested that more intensive study be given to crawler-mounted equipment. He gave as the reason for this suggestion the changing conditions in railway labor and predicted that further expansion in the use of off-track machines will solve some of the problems that are already arising as a result of these changes and of others that are now pending. It was his view that while the types now available are helpful in maintenance operations, the type of machine that will be needed in the near future is not now available. It was his thought, therefore, that the committee should collaborate with both railway officers and manufacturers in an intensive study of this subject for the purpose of developing what this need will be and the best means of providing equipment to meet it.

Water Service, Fire Protection and Sanitation

B. W. DeGeer, Chairman*

During the year this committee gave consideration to nine assignments and presented progress reports on two and final reports on four. The latter included reports on types of tannins used in water treatment; hose pipes or nozzles—types and uses; trucks for use by water service maintenance forces; and methods for checking and handling the control of locomotive blowdowns. On three of its assignments the committee reported progress in study.

* Engineer Water Service, Great Northern.

Tannins Used in Water Treatment

Pointing out that the term "tannin" does not appear to be fully understood the committee confined its report on tannins used in water treatment to a definition of the term and a description of the principal tannins used in water treatment. The term "tannin," said the report, is a class name for astringent plant products which have certain characteristic color reactions and properties.

Since the exact composition of the various tannins is not known they are identified by their characteristic reactions which include the following: (1) Astringency: (2) the property of forming a dark blue color or a greenish color with ferric salts: (3) the property of forming a precipitate with gelatine, albumen and some alkaloids: and (4) the property of converting hide into leather. On the basis of these reactions tannins are classified as depside tannins, ellagitannins, and phlobatannins.

The depside tannins and the phlobatannins were treated at some length in the report, the discussion including a description of the different sources of the tannins and their properties. The report also discussed briefly the manufacture of tannins, the influence of impurities in water treatment and the use of several related compounds in treating water. Brief consideration was also given to the advantages claimed for tannins when used in water treatment, and attention was called to the fact that, because of the more or less distinct individuality and varying tannin content of the various extracts, tannins should not be accepted or used indiscriminately. This report was offered as information.

Pitting and Corrosion of Boiler Tubes and Sheets

In its report on this subject, submitted as information, the committee stated that excellent progress has been accomplished in the study of the elimination of intercrystalline corrosion, formerly called "embrittlement" or "caustic embrittlement," and said that the work done at the United States Bureau of Mines under the joint sponsorship of the A. R. E. A. and six other associations has definitely indicated that this type of boiler trouble can be eliminated by means of the organic material known as Lignin.

The committee explained that it is very difficult to determine the presence of this material in steam boilers, and described in detail a colorimetric method for achieving this end, which was developed as a result of the research conducted at the Bureau of Mines. This method of analysis, said the report, is free from interference by sulfate, silicate, chloride, phosphate, hydroxide, and sulfite, as well as most of the positive ions encountered in water samples, but it is subject to some interference by ferrous iron, calcium carbonate and some organic materials. Tannin materials, including cutch and guebracho, may also be determined by the new method, said the committee, and it went on to prescribe the manner in which lignin and the tannin materials should be used for the prevention of intercrystalline corrosion.

Value of Water Treatment

The report of the committee on the value of water treatment, offered as information, included a monograph by W. L. Curtiss, mechanical engineer, New York Central, describing the results of an investigation on this road. The remainder of the report was designed primarily to furnish an historical background for the monograph. Thus, the committee reviewed previous efforts to place a value on the treatment of water for locomotives, and stated that, as a result of tests conducted on the Illinois Central, it had been established that the value of 13 cents per pound for the solids removed in water treatment was a safe figure for the reason that it was an underestimate.

Notwithstanding the progress that has been made in improving boiler water conditions during the last 40 years, the committee estimated that there are still 200 billion gallons of water being used annually by the railroads which can be profitably treated. Also it estimated that there is an opportunity for effecting an annual saving of $12,000,000 through the elimination of corrosion in locomotives by the proper treatment of boiler water.

In his monograph, Mr. Curtiss said that the investigation conducted on the New York Central was undertaken for the pur-

pose of determining, if possible, the actual loss from the use of bad water, without resort to a formula derived from data collected on other railroads under different conditions. For comparative purposes, four districts were selected for the test, namely, the Ohio Central Lines, the Lines West, the Lines East, and the Boston & Albany. For each of these districts, statements were obtained in 1923 showing the actual tons of locomotive fuel consumed, the actual direct labor and material cost of boiler repairs and also complete locomotive mileage statistics. Tabulations giving the results of the tests were included and from them Mr. Curtiss deduced that the loss due to bad water on the New York Central alone amounted to $3,117,627 for the year 1923.

He also compared the results of the tests with those obtained through application of the A. R. E. A. formula, and went on to discuss intangible losses not considered in either the investigation or the A. R. E. A. formula. The possible increase in fuel consumption resulting from the boiler water blowdown that must accompany water treatment was also given consideration, and the results of tests conducted to determine the influence of this factor were given. In his conclusion, Mr. Curtiss observed that "in the case of the New York Central, at least for the year 1923, the facts presented support the A. R. E. A. formula to a degree that is remarkable, and also indicate that the formula is conservative."

Hose Pipes or Nozzles—Types and Uses

In its report on the types and uses of hose pipes or nozzles, the committee presented brief descriptions of the operation and application of the different types of nozzles that are in use for fire-fighting purposes. Those mentioned include the Underwriters standard play-pipe, which is recommended for use by shop fire brigades; the plain nozzle, for use inside buildings; the Boston play-pipe, used for high-pressure streams; the control nozzle, adaptable for use at small shop properties or stations; the shut-off nozzle; the cellar, roof and deck pipe; the monitor-type deluge pipe, used on tug boats and at tie, timber and coal storage yards; a control type nozzle which fits as a tip on the Underwriters' and Boston play-pipes; a combination solid stream and vapor nozzle; an approved water-spray nozzle for use on oil fires; and the locomotive-type nozzle.

The report also included a tabulation of data developed by John R. Freeman showing the characteristics of fire streams for different sizes of nozzles. Among other values, this tabulation gives the pressure required at the hydrant or pump to maintain a given pressure at the nozzle through various lengths of 2½-in. smooth rubber-lined hose. This report was submitted as information.

Control of Locomotive Blowdowns

The report on locomotive blowdowns, which was offered as information, gave detailed consideration to the control of boiler blowing and to the facilities provided to make it possible to blow down boilers wherever and whenever the engineman considers blowing to be needed or desirable. Emphasis was placed on the need for maintaining close supervision of this operation at each terminal, and instructions were given for obtaining and testing boiler water samples, consideration being given to both the specific gravity test and the electric conductivity measurement test.

The report also discussed various types of blow-off valves and stated that an electrically-operated valve that has been developed constitutes at present the nearest approach to a completely satisfactory device. Consideration was also given in the report to methods of disposing of the discharge from blow-off valves at terminals and on the road, and attention was given to the question of providing instructions for enginemen regarding blowdowns. In its conclusion the committee stated that routine checks of boiler water should be made at all terminals, that suitable blow-off valves, blow-down boxes and mufflers should be provided, and that instructions issued to enginemen should be sufficiently flexible to permit them free exercise of their judgment.

The report was received without discussion.

Trucks for Use by Water-Service Forces

In its report on the use of trucks by water-service forces, which was offered as information, the committee reviewed the developments that have led to the increasing use of highway trucks in water-service maintenance work, cited the experiences of several railroads with the use of trucks in this branch of the service. A questionnaire was sent to the members of this committee to secure information on the extent to which motor trucks are used for water-service work by the railways represented on the committee. The information received indicates that 15 of the railways represented on the committee have 154 trucks assigned to the maintenance of way department, of which 28 are used in water service work, including 2 passenger automobiles and 1 truck used only part of the time. The committee concluded that the use of motor trucks for water-service men is justified for the following reasons:

1. Saves time in getting to the job because the equipment is promptly available day or night.
2. Greater safety on the roadway where flagging, meeting and passing regulations are not complicated.
3. Greater economy in handling as compared with a work train or heavy rail motor car, including the load.
4. Greater tool and material-carrying capacity than light rail motor cars or speeders.
5. Decreased cost in overhead and operating expense, compared with work-train or switching service.
6. Economy in drayage costs as against similar work by contract truckers.
7. Railways are taxed for highway purposes and the maximum use of highways for railway equipment is not inconsistent.

Report of Committee on Clearances

A. R. Wilson, Chairman*

The committee reported progress in connection with its assignments on revision of the Manual and on the provision of clearance diagrams for recommended practice. It also continued its study of clearances as affected by half-through inter-track girders and structures, and on third rail, signal and train control equipment, collaborating with the Electrical section, Engineering division, and with the Mechanical and Operating divisions.

The report of the committee on the latter assignment was covered by a diagram entitled "clearance diagram encroachments," with a recommendation that it be received as information and that a note be placed in the Manual calling attention to this information. The diagram shows encroachments on the recommended clearance diagram for railway bridges of half-through girders, third rail, high platforms and inter-track fences.

Supplementing the presentation of the report, the recommendations in which were approved without vote, Chairman Wilson stated that, acting on the request of J. M. Symes, until recently vice president operations and maintenance department, A. A. R., a committee representing the various divisions of the A. A. R. had made a complete review of the Railway Line Clearance publication as regards clearance diagrams contained therein, and was proceeding with the development of an equipment clearance diagram to be used in connection with Car Service Rule 14d. The diagram under consideration will broaden the scope of this rule, so that the responsibility for the cost of transferring lading will be placed upon the delivering road when the dimensions of a car exceed those shown in the proposed equipment diagram. There was no further discussion.

Report of Committee on Highways

J. G. Brennan, Chairman†

In reporting on its nine assignments, the committee recommended revisions in Manual material, presented reports complete with recommended conclusion for publication in the Manual on four assignments, and reported progress in the study of three other subjects, and presented one progress report.

Revision of the Manual

Referring to the drawings in the Manual showing the 50-deg. Reflector Crossing Sign, the committee pointed out that no ordering references or mounting are shown, that the crossbuck is painted black on the back, and that an intermediate plate is required. An additional drawing has been developed entitled "Highway Crossing Sign—50 deg. Reflector Type" showing the

* Engineer Bridges and Buildings, Eastern Region, Pennsylvania.
† Engineer Grade Crossings, Association of American Railroads.

sign mounted, together with the "number of tracks" sign, on a pipe post with a concrete foundation. Also, the height may be varied as required by local conditions and the drawing bears the AAR Signal section No. 1691A and numbers for ordering parts.

Drawing No. 902 has been revised to show the mounting and complete ordering references, and bears the AAR signal section number for ready reference and the ordering of parts. Likewise Drawing 903 has been revised to show the Signal section number and ordering numbers, and also to show the crossbuck painted white on the back instead of black and to indicate that the intermediate plate is optional. All three drawings indicate that synthetic or vitreous enamel is optional.

The committee recommended the adoption of all three of these drawings and their publication in the Manual in place of Figs. 902 and 903.

These plans were adopted.

General Requirements for Crossing Gates

In reporting on its assignment to develop drawings showing general requirements for the installation of automatic gates, the committee presented three typical location plans for automatic crossing gates, one showing a right-angle crossing and two showing skew crossings. It was recommended that all three drawings be adopted for publication in the Manual.

These drawings were adopted.

Classifying Grade Crossings as to Hazard

The report on the classifying of grade crossings as to hazards consisted in large part of a tabulation of the chief factors entering into the determination of a method for such a classification of crossings. First, however, the committee pointed out that any method of classifying crossings should be definite enough to present an orderly guide for the comparison of crossings involving all degrees of hazard, so that any series of crossings may be listed in the order of priority for improvement.

The committee's tabulation was divided into two parts, namely: (A) the physical characteristics of the crossing, and (B) the railway and highway traffic passing over the crossing. It also stated that a suitable plat of the crossing and vicinity was a necessity and that photographs were desirable. Pointing out that the comparative weights allocated to the different factors set forth in the tabulations govern the rating of the crossing, the committee urged that special care be used in determining such weights. This report was submitted as information.

Floodlighting of Railroad-Highway Crossings

In discussing the floodlighting of highway crossings, the committee presented 15 requisites covering such factors as the conditions making floodlighting desirable; characteristics of the beams; the distance that the illuminated equipment should be visible; the number, height and location of the lights; the character of the illumination; control of the lights; conditions under which continuous illumination is desirable; manner of coping with burn-outs; and the need of making arrangements to prevent lights from burning during the day.

These requisites were recommended for inclusion in the Manual.

This recommendation was approved.

Lamps on Manual and Automatic Crossing Gates

The report on lamps on crossing gates comprised of a list of recommendations covering the mounting of lamps on manually-operated crossing gates and on automatic crossing gates. It was recommended that the report be received as information until such time as a satisfactory specification for the electric lamp unit has been worked out by the Signal section.

Requisites for Automatic Crossing Gates

Last year the committee developed a list of requisites for automatic crossing gates, which was approved for inclusion in the Manual. However, identical requisites developed by a committee of the Signal section were not approved by that section, and for this reason it was decided not to publish the requisites in the A. R. E. A. Manual until the subject could be given further joint consideration. This has now been accomplished and the committee again presented a list of 17 requisites for automatic crossing gates, which it recommended be adopted for publication in the Manual.

In presenting the report, the committee recommended a revision of requisite No. 9 to provide for three lights for each gate arm, the end light to be steady and the others to be flashing. The change also provided for night lighting only. This change made requisite No. 16 unnecessary and the committee requested its elimination. With these revisions the requisites were adopted.

The chairman announced that the Signal Section had adopted identical requisites at its annual convention on the previous day.

Signals and Interlocking

H. G. Morgan, Chairman*

In line with usual practice, this committee reported on two assignments, namely, Developments in Railway Signaling, and Principal Current Activities of the Signal Section, A. A. R. Under the first assignment it reported that there had been no developments since those reported to the annual meeting in 1938.

The report on the second assignment included a list of 34 subjects on which the Signal section was working during the 1937 fiscal year and on which it reported at its 1938 convention. It also directed attention to the fact that there are now available 21 of a series of 24 pamphlets on American Railway Signaling Principles and Practices, which have been prepared for the education of signal men and others desiring to study this subject.

In addition the report lists the specifications, drawings, requisites, instructions and tables that have been revised by the Signal section, together with new specifications and drawings that have been approved, and specifications, drawings and miscellaneous matter that have been removed from the Manual.

In presenting the report, Chairman Post stated that two developments had taken place since the report was printed. The first is the use of short-arm gates, the arms extending over half of the roadway, one arm being placed between the tracks and oncoming traffic, that is, only two gate arms to a crossing, so arranged, one on each side, as to bar approaching vehicular traffic.

The other development is the use of automatically-lighted "No Right Turn" and "No Left Turn" signs for use on highways that parallel tracks at points where lateral roads cross the tracks and either join or cross the parallel highway. Through traffic is thus permitted to move normally, but diverting traffic is warned of approaching trains by means of yellow flashing signals.

The report was received without discussion.

Economics of Railway Labor

F. S. Schwinn, Chairman†

During the year this committee gave consideration to 11 assignments, concerning which it presented complete reports which were offered as information on 4, presented material for inclusion in the Manual on 4, and reported progress in study on 3 of the assignments.

Economics of Weed Killing

The report on Economics of Weed Killing, which was submitted as information, was confined to a consideration of weeds and vegetation growing on the right-of-way outside of the roadbed, an extensive report on the eradication of weeds within the confines of the roadbed having been presented at the 1936 convention. The committee reported that it had been furnished information by more than 30 railroads regarding their respective practices in controlling weeds, and quoted at length from replies received from two.

One of the latter was from a prominent road located in a part of the country where weed growth is heavy, and which, after listing the types of vegetation encountered on this road, described a program that has been conducted for the purpose of leveling the right-of-way to improve the operation of mowing machines. The other reply quoted in the report included an analysis of economies that have been affected by leasing available parts of the right-of-way for agricultural purposes.

As a result of the committee's study of the information given by the railways it concluded that (1) it is generally found to be

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an economy to provide a smooth right-of-way to the extent that will permit mowing with machines; and (2) that it is generally a further economy to seed the right-of-way after smoothing it, with grass suitable for the locality.

Organizations and Methods in Maintenance Work

In reporting on the assignment "Organization of Forces and Methods of Performing Maintenance of Way Work" the committee confined its attention this year to the construction and maintenance of wooden trestles. On the basis of data received in replies to a questionnaire, the committee presented what it believed to be economical gangs for (1) pile driving and decking, and (2) ordinary trestle maintenance. Suggested organizations were also presented for a combination pile-driving and decking gang and for a gang engaged in ordinary maintenance work in which it was pointed out that the interests of efficiency will be secured by using six men or multiples of six in capping, eight men or multiples of eight in decking, and six men or multiples of six in a repair gang. This report was offered as information.

Effect of Increased Weight of Rail on Track Labor

At the outset of its report on the Effect of Increased Weight of Rail on Track Labor, the committee explained briefly the obstacles lying in the way of a statistical determination of the effect of rail weight on track labor, and then went on to discuss at length the results of a survey covering a total of 39 roads in the United States and Canada having a combined line mileage of 226,000. Estimates of the reduction in the amount of labor required to keep the track in line and surface, effected as a result of the use of heavy rail range from 20 to 50 per cent, said the report.

Attention was also given to the indirect savings in labor costs that are effected as a result of the fact that it is not necessary to renew heavy rail as frequently as the lighter sections. In addition, the use of heavy rail tends to decrease tie renewals by increasing tie life, and to reduce the labor required for reconditioning the joints and for surfacing the track. Considerable attention was directed to the experiences of the Kansas City Southern with heavy rail and figures were presented to show the effect which the use of such rail on this road has had on labor costs. The committee then turned to the Bessemer & Lake Erie which began the use of 130-lb. rail in 1917.

While this report was offered as information, the committee appended five conclusions with the recommendation that they be adopted for inclusion in the Manual. These are as follows:

1. The use of heavy rail in heavy-traffic, high-speed lines reduces the amount of labor necessary to maintain a given standard of track excellence.

2. This reduction is both direct and indirect. The items affected directly include line, surface, gage, joint maintenance and laying rail. The items affected indirectly include tie renewals, cleaning ballast and ballast renewals.

3. Since the labor required for practically every item of track maintenance is affected also by factors that have no relations to the weight of the rail, it is impossible to segregate those factors in such a way that the effect of the heavy rail alone can be evaluated.

4. The magnitude of the economy that can be realized from increasing the weight of rail depends on the relative stiffness of the heavy rail and the lighter rail that it displaces, the volume of traffic, the axle loads and the speed of trains.

5. For lines of high traffic density, the saving in track labor following the installation of 112 and 131-lb. sections in place of sections weighing 100-lb. and lighter may reach 40 per cent of the total expenditure for this item. As the volume of traffic decreases, this saving also decreases until a point is reached where considerations other than savings in labor must justify the increase in weight of rail.

These conclusions were adopted without discussion.

Labor Costs and Increased Capital Expenditures

In this year's report, which was submitted as information, the committee presented supplementary information concerning various phases of the relation between labor costs and increased capital expenditures. Announcing that additional detailed information had been secured concerning installations of perforated corrugated pipe, it presented data showing the savings effected as a result of two such installations. Figures were also presented to show the savings in labor costs that may be expected to accrue through the substitution of treated for untreated ties and the experience of a middle-western railroad in this respect was given in detail.

Turning to the subject of labor-saving machinery, the committee gave examples of savings effected by different types of equipment in specific instances. Brief information was also given regarding labor economies to be effected through increased capital expenditures for bridges, buildings and other structures. The committee reported that for various reasons it was not able to present similar information regarding ballast, tie plates, rail anchors, signals and interlockers and the driving of cull ties and piles in soft track.

The committee drew the conclusion that studies show conclusively that marked economies can be obtained by certain capital expenditures and they should be given consideration whenever funds are available.

Sanitary Provisions in Labor Camps and Cars

The committee first discussed briefly the various conditions under which railroads find it necessary to provide living accommodations for employees, and gave brief consideration to the favorable influence which proper food and accommodations have on the efficiency of labor. Next it presented references to Manual material on various aspects of this subject and recommended for inclusion in the Manual additional sanitary provisions pertaining to food, dishwashing, floors, etc., linen, water for drinking and culinary purposes, toilet facilities, showers, wash and toilet car, insects and rodents, medicinal inspection, laundry, housekeeping, location, policing and inspection. The committee also recommended that certain material be deleted from the Manual, and offered as information a suggested inspection form for rating the condition of boarding cars and camps.

W. A. Radspinner (C. & O.) spoke of the importance of proper fire protective measures and equipment about labor camps, and suggested that suitable reference should be made in this regard in the material being being offered by the committee for inclusion in the Manual.

Both Chairman Schwinn and Vice-President Hastings agreed that such reference might well be included in the Manual, but did not feel that it should be included in the material submitted with regard to sanitary provisions.

The recommendations of the committee were then adopted.

Economic Relation Between Supervision and Labor

Although the committee presented a report on the economic relation between supervision and labor in 1929, it was deemed advisable, in view of the drastic reduction in forces and changes in organization that have occurred since then, to make a further study of the subject at this time. Accordingly, data were compiled from representative railroads from which a statement was prepared showing in percentages the extent of the reduction in labor and supervision that occurred between 1929 and 1937, this statement being submitted as an addendum to the report. On the basis of its study the committee concluded that (1) the ratio of supervision to labor is an individual problem to each railroad; (2) the ratios in 1920 and 1937 were not the most economical in every respect; and that (3) general economic conditions will always affect the ratio of supervision and labor. This report was submitted as information.

Effect of Allowances on Maintenance Costs

In reporting on its assignment to determine the effect of sudden fluctuations in maintenance expenditure allowances on maintenance costs, the committee listed the adverse effects of sudden increases and decreases, and also presented a list of reasons why a stabilized labor force, free from sudden fluctuations in maintenance expenditure allowances, will help hold maintenance costs to a minimum. In its conclusion, which it recommended be published in the Manual, the committee said that "sudden fluctuations in maintenance expenditure allowances increase labor costs and adversely affect the quality of the work."

This recommendation was adopted.

Revision of the Manual

Under Revision of the Manual, the committee made specific recommendations concerning the manner in which it desires to have published in the Manual the various conclusions presented under the individual subjects. With respect to the sub-committee report on the economics of methods of weed killing it was

pointed out that this report, together with a report presented on the same subject in 1936, contains valuable material which the committee likewise recommended for inclusion in the Manual.

A question regarding the advisability of including in the Manual the material with reference to weed control was raised by H. E. Tyrrell (Sou.) on the ground that it represented only general comments concerning the desirability and economy of weed control, without definite factual material concerning recommended practices, but when Chairman Schwinn argued for the inclusion of the material on the ground that it formed valuable reference data for maintenance officers, and support for their recommendations for this class of work, the material was adopted without further discussion.

Report on Track

C. J. Geyer, Chairman*

The committee submitted reports on 11 of its 12 assignments, offering Manual material with respect to 4 subjects, and reported progress in the study of the assignment pertaining to the design of tie plates for RE rail sections.

Revision of Manual

For the purpose of supplementing the information shown in the plans and to assist in the manufacture of the tools involved, the committee submitted revised plans for a clay pick; a tamping pick; track wrenches for A. S. A. heavy and regular nuts; a claw bar, design No. 2; and for track chisels, designs No. 1; and No. 2. No changes in design are embodied in the revised plans.

The committee also submitted for adoption as recommended practice the following revised plans:

Plan No. 774—Crossing with solid manganese steel frogs and interior rolled closure rails, angles below 25 deg. and above 14 deg. 15 min., single-rail construction.

Plan No. 775—Crossing with solid manganese steel frogs and interior rolled closure rails, angles below 14 deg. 15 min. to 8 deg. 10 min., inclusive, single-rail construction.

All of these plans were adopted.

Fastenings for Continuous Welding of Rail

Continuing its practice of making inspections of continuously-welded rail, the committee made an inspection during the past year of the installation of butt-welded rail on the Central of Georgia at Lovejoy, Ga. This installation, it said, is of particular interest because no special type of rail fastening was used, the rails being held in place by double-shouldered tie plates, cut spikes, and a limited number of rail anchors. This installation was described in detail in the report and the results of measurements and observations, many of them embodied in charts and tables, were given. Notable among the tables is one giving the lateral and longitudinal movement of the rail at various stations and at intervals of time from December 1, 1937, to October 8, 1938.

The report also embodied further information regarding installations of butt-welded rail on the Delaware & Hudson and the Bessemer & Lake Erie. Based on its observations and studies to date, the committee offered a set of four comments pertaining to the adequacy of the various types of fastenings used. The committee also presented eight principles bearing on the design of a screw spike to be used as an independent tie-plate fastening. This report was offered as information.

Plans and Specifications for Track Tools

Under this heading the committee offered for study and comparison a new and lighter design of timber tong which, it said, offers improved features in the way of safety and workability. This plan was offered as an alternate design and for information with the understanding that later it will be offered for adoption as a substitute for the present design, and printed in the Manual.

Switches, Frogs, Crossings, Slip Switches, Etc.

Explaining that it had continued work on the preparation of detailed plans covering curved switches, the committee discussed certain problems which it had encountered in preparing a plan for an 11-ft. curved switch with uniform risers. Such a plan, designated as Plan No. 121—11 ft. curved split switch with uniform risers, was offered with the recommendation that it be adopted as recommended practice and printed in the Manual.

The committee also reported that further study of the subject of spring rail frogs had resulted in the preparation of a detail plan for a short spring rail type with a heavy base plate support and suitable for use in heavy main line service where traffic is infrequent through the turnout. This plan was designated as plan No. 405—No. 10 spring rail frog for heavy and medium weight rails—short spring rail type, and was also offered for adoption and printing in the Manual as recommended practice.

These plans were adopted.

Corrosion of Rails and Fastenings in Tunnels

Explaining that no thoroughly satisfactory answer to the problem of corrosion in tunnels has been found, the committee discussed briefly the two general causes of corrosion—electrical and chemical—and said that it is gathering data from the railroads by means of which it hopes to determine the relative importance of the two corroding agents—carbon dioxide and sulphur dioxide. Brief mention was also made of an investigation which the committee is conducting in a tunnel 6.2 miles long. This material was offered as a progress report.

Reflex Units for Switch Lamps and Targets

In a brief report, submitted as information, the committee presented the results of a questionnaire that was sent to railroads for the purpose of determining the extent to which reflex units are in use. In answering this questionnaire, 11 railroads reported no experience and little interest in such units, while 13 roads reported a total of 4,588 units in service. The questionnaire also developed such information as the general preference regarding the manner of use, annual costs, types of location in which the use of reflex units is considered practicable, efficiency of the units, the reaction of locomotive engineers and firemen, and the effects of snow and ice accumulations.

Welding of Manganese Castings

In a further study of the welding of manganese castings, as it applies to special trackwork, the committee encountered a diversity of opinion which pointed to the need for further research. Accordingly, it has set up a research program which was outlined in the report. The committee reported that offers for co-operation have already been tendered by several manufacturers and also by a number of railroads, the latter having offered to install test castings in their tracks as well as to make the necessary welds.

Bolt Tension

In reporting on its assignment pertaining to the bolt tension necessary for the proper supporting of rail joints, the committee described the results of tests that have been conducted on the Chicago, Milwaukee, St. Paul & Pacific, the Chicago, Burlington & Quincy and the Denver & Rio Grande Western. The committee reported that its work on this assignment had not progressed sufficiently to permit conclusions or recommendations to be made, but said that considerable effort had been made to develop means for setting up a predetermined tension in bolts with encouraging success.

Lubrication of Rail on Curves

Referring to the tentative report on the lubrication of rail on curves, that was submitted last year, the committee reported that it had continued its study of the subject and submitted considerable additional information regarding the annual cost of mechanical lubricators installed in track, the use of mechanical flange lubricators on locomotives, results obtained through the use of mechanical lubricators on locomotives applying lubricants direct to the rail, and manual lubrication of the rail. The following conclusions were presented for inclusion in the Manual:

The life of rail on curves can be extended by the lubrication of the rails. This can be accomplished by the following methods: (1) mechanical lubricators installed in the track; (2) mechanical flange lubricators on locomotives; (3) mechanical lubricators on locomotives applying lubricant directly to the rail; (4) manual lubrication of the rail.

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In addition to increasing the life of rail on curves, lubrication will (1) decrease locomotive-driver and wheel-flange wear; (2) increase the service life of ties because of decreased gaging; and (3) decrease resistance to train movement.

The economic justification of lubrication depends upon the annual saving which may be obtained compared with the total annual cost of the lubrication.

The committee withdrew these conclusions with the request that the subject be assigned for further study.

Design of Cut Track Spikes

To overcome the difficulties encountered in driving the present standard cut track spike at joints, the committee submitted last year a design for a short-headed cut track spike for use with A. R. E. A. toeless joint bars. While the new spike was originally suggested for use at rail joints, further consideration has convinced the committee that the spike is well adapted to general use. Therefore, it is now offering the short-headed spike in two lengths (6½ in. and 6 in.) for such use and in its report it submitted a plan for the spike, which it recommended be adopted as an alternate standard and incorporated in the Manual.

The plan was adopted.

Prevention of Brine Drippings

The report on the prevention of brine drippings consisted of a presentation of the results of laboratory tests to determine the efficacy of strontium chromate as an inhibitor of corrosion from brine drippings. The tests were conducted on the Chicago, Milwaukee, St. Paul & Pacific, the Chesapeake & Ohio, and the Denver & Rio Grande Western, and were carried out under the direction of a joint committee consisting of subcommittee 12 of the Track committee and four representatives of the Mechanical division, A. A. R.

Complete Roadway and Track Structure

John E. Armstrong, Chairman*

This committee submitted progress reports on both of its assignments, one of which calls for a classification of railways, while the other pertains to complete roadway and track for various loads and traffic densities.

Classification of Railways

Under this heading the committee stated that it first thought that a classification should be developed for railway main tracks based on the individual wheel loads, the total annual tonnage and the speeds of trains passing over them. After consideration of the problem, however, it came to the conclusion that, for the purpose of this report, individual locomotive and car wheel loads may be disregarded and the classification of railway main tracks based on the total annual tonnage and the speeds of trains passing over them. On this basis, the committee developed a tentative classification of main tracks embodying three classes (A, B and C) which it submitted for discussion, criticism and suggestions.

In answer to a question, the chairman said that the tonnages which were used as the bases for the classifications were total tonnages passing over the rails, including lading, equipment and locomotives. J. V. Neubert (N. Y. C.) called attention to the fact that the classification as presented does not specify the type or class of construction and has no reference to the materials entering into the track or roadbed, to the standards of maintenance of any road or to the degree of refinement in maintenance that may be practiced.

Complete Roadway and Track Structure

Based on the tentative classification of main tracks submitted under its other assignment, the committee offered a tentative schedule of classes of complete roadway and track structure under A. R. E. A. recommended practice, which was likewise submitted for discussion, criticism and suggestions. The committee said that the three classes of complete roadway and track structure must not be regarded as definitely fixed and that the presence of favorable or unfavorable conditions may make economical, in whole or in part, a higher or lower class of structure than that indicated by tonnages and speeds alone.

In response to a question, the chairman stated that the schedules that accompanied the report were not based on studies of costs or of the economics of rail, fastenings, ties, ballast, or other items of track construction and that the refinements required in track construction and maintenance varied so widely to conform to varying conditions of traffic and physical surroundings that such bases were practically impossible.

* Chief Engineer, Canadian Pacific.

Roadway and Ballast

A. E. Botts, Chairman*

This committee presented detailed reports on 6 of its 12 assignments, offering Manual material in connection with 5 of these reports. Progress was reported in the study of the other six assignments.

Culverts

Under the heading of culverts, the committee offered for approval and inclusion in the Manual a new article pertaining to the location and type of culverts, this article comprising a revision of similar material that was presented as information at the 1938 convention. The new article (301) covers such subjects as the size of the waterway required, the span required, character of the hydraulic traffic, topographic conditions, foundation conditions, height and character of embankment, loading, and economics of various types.

The committee emphasized that the determination of the proper size of culvert openings requires knowledge of the drainage area, run-off, data on past performance, such as high water marks at, above and below the opening and pertinent formulas, with experience and good judgment in interpreting them. The ideal opening is one in which the velocity of the stream above the opening is maintained or slightly increased through the opening and below to a point where the flow will have no effect on the railways. Attention was also called to the fact that the span of the culvert should be such that the property above will not be affected injuriously at times of maximum run-off or a head created which will induce destructive velocities. It was also recommended that for practical reasons a minimum size of pipe culverts should be established, even though run-off computations show that a size smaller than the minimum might be used. In this recommendation a minimum diameter of 24 in. was recommended for main line track; for highway crossings and unimportant tracks the minimum diameter may be made 18-in. The reason for this is that pipe structures smaller than these are difficult to clean out and may be of insufficient capacity if freezing occurs.

In the discussion of the character of hydraulic traffic, that is, the abrasive or corrosive effect of water passing through a culvert, it was stated that except in localities of such specialized service classification as mineralized, organic and salt water which are relatively small in area compared with the country as a whole, corrosion from soil and water is far less important in shortening the life of drainage structures than is the abrasive action of hydraulic traffic. So far as soil corrosion on the outside of structures is concerned, the extensive soil corrosion tests of the Bureau of Standards now in progress for more than 12 years, show conclusively that in only about 10 per cent of the soil is corrosion from the outside severe; that in about another 10 per cent the corrosion is mildly severe; and that in more than 80 per cent the soil corrosion is negligible. On the other hand, mine water, especially water from coal mines, is particularly difficult to handle with respect to internal corrosion as it attacks all commonly used materials except possibly well burnt vitrified clay pipe.

It was pointed out that alkali soils are of two kinds, black alkali and white alkali. White alkali usually contains quantities of sulphate, carbonate or chloride which, upon evaporation of moisture in the soil, leaves a white crust on the surface. The black alkali, a sodium carbonate, does not leave the white crust. The white alkalis, particularly those containing sulphates, are more severe on concrete than on metal, while the black alkali

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and the chloride salt alkali are relatively more severe on metal than on concrete.

Sea water is injurious to all types of drainage material. The chloride in the salt water shortens the life of metal structures while the alternate wetting and drying and the frost action in cold climates accelerate the deterioration of concrete.

Attention was also called to the fact that a culvert should usually be given the same general gradient as the stream bed. It was pointed out that one of the most common mistakes is to place the invert at the same elevation as the stream bed, with the result that sedimentation reduces the effective area of the opening. For this reason, it is generally preferable to have the bottom of the culvert 2 to 4 in. above the stream bed. It was also recommended that where there is a possibility of subsidence of the natural ground, culverts under new fills should be laid or constructed with sufficient camber so that there will be no dips or depression in the culverts when subsidence has stopped.

This article was approved.

In its assignment pertaining to vitrified pipe culverts, the committee reported that, in collaboration with a committee of the A. S. T. M., it is working on a specification for a new class of pipe now on the market known as "triple strength" vitrified clay pipe.

Formation of Roadway

Dealing with that portion of its assignment pertaining to width of roadbed and angle of slope, the committee presented a new article (402) for adoption and inclusion in the Manual in place of existing material appearing under the headings: A. Width of Roadway at Subgrade; and B. Slopes. The new material was presented under three general headings—Widths and Slopes, A. Widths of Roadbed, and B. Slopes—and was accompanied by six conclusions.

This article was adopted.

Tunnels

The report on this subject dealt with ventilation, and in order to obtain information regarding present practice the committee submitted a questionnaire to 11 railroads, all of which submitted complete replies. Using the material thus obtained, the committee compiled in tabular form a list of the railroad tunnels 2,000 ft. long or longer that are not ventilated, a list of the tunnels that are mechanically ventilated, and a list of those that are ventilated by air shafts. Included with the report was an extensive bibliography of articles on railroad tunnel ventilation.

The following conclusions were presented which the committee recommended be adopted for printing in the Manual:

1. Artificial ventilation for tunnels 2,500 ft. or less in length is unnecessary.
2. For tunnels over 2,500 ft. in length, study to determine the proper method of ventilation should be made, giving due consideration to operating and other local conditions.
3. Shaft ventilation is of limited benefit.
4. Where electricity is available, it is the most economical type of power for operating a mechanical ventilating plant.

These conclusions were adopted.

Signs

With regard to its assignment pertaining to roadway signs required, the committee presented material which it recommended be adopted for inclusion in the Manual as recommended practice. This material comprised three articles as follows: 901, Roadway Signs Required; 902, Principles of Designs and Rules for Use; and 903, Economy of Various Materials. A definition of "roadway sign" was also submitted for inclusion in the Glossary.

These recommendations were approved.

Referring to its assignment pertaining to close-clearance signs, the committee reported that on the basis of plans received from a number of railroads, it had developed drawings for four close-clearance signs, which were reproduced with the report. It also presented a set of six conclusions. This phase of the report on signs was submitted as information.

Use of Asphalt in Ballast

Stating that it believes there is need for a waterproofing material that could be mixed with stone ballast which would exclude moisture and foreign matter, the committee said that an asphalt material, if it met certain requirements, would answer the purpose. Suggested specifications for an emulsified asphalt for use in this manner were given and a method of procedure for installing a mixture of emulsified asphalt and stone ballast was included. This report was submitted as information.

In addition to those subjects commented on above, the committee reported progress in the study of its assignments pertaining to physical properties of earth materials, natural waterways, roadway drainage, roadway protection, and fences.

Ballast Section Design

The committee presented four ballast-section plans designed for curves and recommended that they be adopted for inclusion in the Manual. Of these Sections No. 1 and No. 2 were recommended for super-elevations up to and including three inches, while Sections No. 1-A and No. 2A were recommended for super-elevations in excess of three inches.

This recommendation was approved.

Report of Committee on Rail

J. V. Neubert, Chairman*

The committee presented progress reports on six of its assignments and final reports on the economies of rail lengths in excess of 39 ft., specifications for relayer rail, and its investigation into the advisability of straightening bent and kinked rails for reuse in main-line track.

Revision of the Manual

For the purpose of clarification and to make the A. R. E. A. specifications conform to those of the A. S. T. M., the committee submitted a number of revisions of the Specifications for Heat Treated Carbon Steel—Alloy Steel Track Bolts—1936 Manual. The committee reported that the rail manufacturers have offered to accept, without increase in the base price of rails, the inclusion of the Every-Ingot Nick and Break Test for the definite indication of "X-Rayls" in the "A" rails, and to make provision for the inclusion of this test appropriate revisions were recommended in the Specification for Open Hearth Steel Rails—1937 Manual.

In answer to requests that it make a recommendation in connection with the slotting and beveling of the ends of rails, the committee recommended the acceptance of slotting and beveling similar to that shown on the Track Committee's A. R. E. A. Plan No. 140. It also recommended that the note, "Spike may be driven as shown, or reverse," be added to Plan 411—Joint Bar and Assembly for 112-lb. R. E. Rail, and to Plan 412—Joint Bar and Assembly for 131-lb. R. E. Rail, which now appear in the Manual.

All of the recommendations of the committee were adopted without discussion.

Research on Mill Practice and Manufacture

The report on mill practice and manufacture comprised a summary of the work carried out in 1937 and 1938 under the direction of the committee in collaboration with the Rail Manufacturers' Technical Committee, and also of an outline of the work planned for 1939. In the latter connection the committee plans to continue its studies of the temperature limits for controlled cooled rails, and it also hopes to start making field tests of end-hardened rails. It feels that the latter work would comprise a major activity of the test party and that eventually it should furnish more authoritative data than that given by rolling-load batter tests made in the laboratory.

The committee stated that since the appearance of the fourth progress report, in which details of the first mill study of temperature limits for controlled cooling of rails was reported, tests have been completed and results tabulated for a second test. In this second test, rails produced by the ordinary process were studied, and other rails were also studied which had been rolled from three ingots through which hydrogen had been passed while the steel was in a molten state. The use of hydrogen in this test was to insure the presence of shatter cracks in ordinary hot-bed-cooled rails. It was highly successful for this purpose, according to the committee. A third test was made along the same line, of rails produced at another mill. The committee stated that the results from these three tests indicate that with adequate controlled cooling, the prevention of shatter cracks in rails is assured. The tests so far made indicate that

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the present standards for controlled cooled rails are somewhat conservative, both as to time and temperature range in the cooling box. However, the committee thought it not wise to suggest a change in the present specifications at this time.

In connection with the presentation of the report on this subject, Dr. H. F. Moore, research professor of engineering materials, University of Illinois, described the various laboratory tests which are being carried out at the University by the Rails Investigation Committee. His remarks, which were illustrated with lantern slides, dealt with methods of preventing shatter cracks in rails; the effect of heat treatment on the properties of rail steels; non-destructive tests for locating minute cracks; and rolling-load tests for determining the resistance to batter of variously treated rail ends.

The committee said that metallographic studies and tests of specimens from end-hardened rails will continue to be made, but stated that whether the investigation shall take up the detailed study of the bend test as a possible substitute for the present drop tests depends on the judgment of the Joint Advisory committee. It is hoped that during the coming year, it may be decided whether to abandon the study of non-destructive tests for shatter cracks or whether results give sufficient promise to warrant carrying it further.

Rail Failure Statistics

In the report on this subject, which was presented by W. C. Barnes, engineer of tests for the committee, the statistics were compiled in accordance with the standard method of basing the failure rates on mile-years of service in track. In accordance with past practice the report contained an analysis of rail failures by mills and a number of charts and tables showing the trend of failure rates. It is interesting to note that the 1932 rollings, of rail, whose period of observation is now concluded, show an average rate of 64.1 failures per 100 track-miles for the five-year period, which is a decrease of 0.3 as compared with the rate reported last year for the 1931 rollings.

Transverse Fissure Statistics

The report on transverse fissure statistics was also presented by Mr. Barnes and consisted of statistics constituting a cumulative record of transverse fissure failures that have been reported up to and including December 31, 1937. Data embodied in this report included a table showing transverse fissure failures on various railroads by years, a chart showing the yearly trend of fissure failures, a table giving the accumulated fissure failures reported to December 31, 1937, by years rolled and by mills, and charts showing failure rates by mills.

According to the report, 7,024 service fissures and 10,955 detected fissures occurred in 1937, as compared with 5,924 service fissures and 9,126 detected fissures reported in 1936. The total of 17,979 fissures reported for 1937 represents an increase of 19.5 per cent as compared with the previous year. An interesting fact is that the number of service failures reported for 1937 (7,024) is greater than has been reported for any previous year.

Controlled-Cooled and Brunorized Rail

In a report on controlled cooling and Brunorized rail, which was presented by Mr. Barnes, it was stated that data are being accumulated to assist in determining the performance of such rail in service and a table was given to show the tonnages of such rails laid in tracks of the roads represented on the Rail committee, as reported on June 30, 1938. Although the tonnage thus reported amounts to 1,096,018, no failures due to transverse fissures had occurred up to December 1, 1938.

Reporting briefly on the A. A. R. detector car, Mr. Barnes said that the A. A. R. leasing service with the Sperry-type car is now in its tenth year and that satisfaction with its efficiency and low cost is evidenced on the part of lessee roads by their repeated requests for service in successive years.

Cause and Prevention of Rail Battering

In a brief progress report on the cause and prevention of rail battering, the committee said that it had continued to receive the assistance of the rail investigation of the University of Illinois in making laboratory studies of submitted samples of rail end-hardening but it feels that final conclusions can only be obtained from field tests. Such tests have been fully outlined and arrangements made whereby the field observations will be undertaken by those conducting the rails investigation.

The committee stated that further studies have been made of the economic value of different sizes of rail, but that it is not yet ready to report.

Rail Lengths in Excess of 39 Ft.

The report on rail lengths in excess of 39 ft. consisted mainly of an exhibit in tabular form showing the comparative economic benefits of rail in 45-ft. and 78-ft. lengths, as compared with rail in 39-ft. lengths. The analysis included 112-lb. and 131-lb. rail sections with an assumed life of 20 years for either section. According to this tabulation, the net benefits of 45-ft. and 78-ft. rail in the 112-lb. section (rail not end-hardened) amount to $1.85 and $6.82 respectively per gross ton of rail, as compared with the 39-ft. lengths. For the 131-lb. section, the net benefits are $1.62 for 45-ft. rail and $6.01 for 78-ft. rail. Where the rail ends are hardened, the net benefits are slightly less than those given above. Moreover, in automatic signal territory the net benefits shown above are increased slightly by amounts representing the saving per gross ton of rail in the cost of bonding joints.

The report also embodied the results of a questionnaire submitted to 66 railroads, showing that of 52 railroads, seven favored 39-ft. rail; eight, 45-ft. rail; two, 50-ft. rail; and seventeen favored rail 78-ft. or more in length. Eighteen railroads indicated no preference. The committee stated that the absence of definite information on the base price of rails longer than 39-ft. seems to be a controlling factor in causing many roads to refrain from definite commitment on the adoption of a longer rail. If it were definitely known that a longer rail could be obtained at a favorable price, it is believed that a majority of the roads would favor its adoption as standard.

The reports also included abstracts of replies favoring 78-ft. rail and discussed various other aspects of the subject of rail length. In its conclusion the committee stated it feels that the economies of 45-ft. and 78-ft. lengths of rails have been developed to the extent that present data make possible and recommended that the subject be discontinued.

Continuous Welding of Rail

Stating that the general plans for the investigation of welding processes as outlined in its 1938 report are being carried out, the committee said that a large number of tests of various types had been made and that the details and results would be presented by Dr. H. F. Moore in his report on the rails investigation. The committee said that beneficial results from the tests so far conducted are indicated by improvements in two of the welding processes under investigation.

Supplementing the report of the committee as presented, Dr. Moore presented a synopsis of the work of the rails investigation at the University of Illinois during the year relative to the testing of various types of welded rail joints. Assisted by lantern slides, he told briefly of the results of tests on grain structure, hardness, tensile strength, and action under rolling-load and drop tests, all of which data he said would be available in detail in the report of the investigation to be published later.

Service Tests of Joint Bars

The committee submitted a progress report on service tests of joint bars by Dr. A. N. Talbot, presenting the status of the test installations now under observation on the Atchison, Topeka & Santa Fe and the Pennsylvania. Dr. Talbot, under whose direction the tests are being carried out, described the different types of observational tests that have been made during the year, gave figures showing the proportions of the installations that have been subjected to observation, told how the test results are to be used, referred briefly to the various types of measuring instruments in use, and discussed in some detail variations in bolt tension that have occurred in the Pennsylvania installation.

Straightening Bent and Kinked Rail

To determine what practices are in use in regard to the straightening of bent and kinked rails for reuse in main-line tracks, the committee sent out a questionnaire from which it received 28 replies. Of these, 17 indicated that no work of this character was being done, 4 roads were gagging bent rails after removal from track in the regulation straightening press, while the remaining 7 roads have used jacks and rail benders of various types to straighten rails both in and out of track. This was submitted as a final report and after a discussion of various other

aspects of the subject the committee offered the following conclusions:

1. That bent rails—the so-called surface bent type—may be restraightened and reused for such service as the engineer in charge may designate.

2. That the physical damage is slight, if any, from the effects of removal of bends in rails.

3. That kinked rails—those due to improper counterbalance or other causes—are not and probably cannot be restraightened for mainline use.

4. That the physical damage to kinked rails has not been investigated by the subcommittee, though evidence through the rails investigation shows that rails can be badly over-stressed a number of times without starting a fatigue crack.

5. That railroads interested in the possible physical damage to kinked rails might use their laboratory facilities to determine through tensile and etch-tests, or more extensive tests of various types, what the relationship is between the kinked and unkinked portions of rails.

Specifications for Relayer Rail

In a final report, the committee outlined briefly the obstacles which it feels have made it impossible to compile specifications for the use of relayer rail that would be acceptable to all the railroads, and for this reason it recommended that the present specifications for relayer rail for various uses be deleted from the Manual.

This recommendation was adopted without discussion.

Stresses in Railroad Track

Dr. A. N. Talbot, Chairman*

The report on this subject comprised a summary of the various tests that this committee has in progress in co-operation with the American Society of Civil Engineers and the Association of American Railroads. During the last year the committee has devoted its efforts and time largely to the continuance of projects already in progress and to the reduction and analysis of tests already made. Reference was made to the fact that a discussion of much of the work of the committee was presented in the proceedings for 1938, including a description of the track tests that were conducted on the Pennsylvania in 1927, further observations of the welded track of the Delaware & Hudson and the Bessemer & Lake Erie and preliminary results of the service tests of various types of joint bars on the Pennsylvania and the Atchison, Topeka & Santa Fe.

The committee said that the large amount of data collected during the track tests on the Pennsylvania has been reduced and is now being correlated and analyzed and prepared for publication. In this connection, it was stated that the many variables present in the action of even excellent track and motive power at high speeds have rendered the effect of the various factors difficult of interpretation. Stating that such tests were necessary for use in the reduction of data obtained in the track tests on the Pennsylvania, the committee said that certain laboratory tests were made on the joints used in the tests.

Passing on to a brief discussion of the service tests of joints, the committee reported that the rolling-load testing machine designed for testing rail joints has been completed and that a series of tests have been conducted to check its operation, power requirements, speed and general suitability. It also said that considerable study had been given to the subject of strain indicating and recording equipment of an electrical nature with a view toward the possibility of acquiring such equipment.

In presenting the report, Dr. Talbot reviewed in some detail the tests that have been made on various roads on tension in bolts in connection with the joint-bar tests that have been carried on for about two years. Assisted by lantern slides, he said that when the bolts were first tightened, as the rail was laid, the drop in tension after about five months' service was not great, but that after the bolts had been tightened a second time the tension dropped about 8,000 lb. in a short period. Later investigation indicated, however, that the joints with the lower bolt tensions were performing satisfactorily. He also illustrated by lantern slides the changes in the rail gap under various bolt tensions and showed that where high bolt tension, reaching as much as 27,000 lb., were employed, the change in the rail gap under temperature changes was only about 48 per cent of what it should have been if the rail had been unrestrained.

In discussing the tests on continuously welded rail he showed that the stresses can be indicated graphically by a straight line, showing that the change in stress is in direct ratio to the change in temperature. He also stated that these relations were the same for temperatures beyond the normal observations even to excessively high and low temperatures. These tests showed, however, that the rail should be laid in moderate temperatures to reduce the stresses in the rail.

He described at some length the tests to determine the moment in the rail and joint under variations in speed. Tests made with an electric locomotive showed that an increase in the moment in one rail was invariably accompanied by a similar decrease in the moment in the other rail, these fluctuations being ascribed to the swaying of the locomotive. Because of this fact the average moments of the two rails can be indicated by straight horizontal line. In all the tests that were made with this type of locomotive the average moment did not vary much from 350,000 in. lb. over the whole range of speed from 40 to 90 miles per hour. He also described the tests and the equipment for making the tests which are being conducted in the laboratory to determine the endurance of rail joints under repeated loading. This part of his discussion was also illustrated by lantern slides.

* Professor Emeritus, University of Illinois.

Report of Committee on Ties

John Foley, Chairman*

This committee presented reports on four of its six assignments and reported progress in the compilation of statistics on substitutes for wood and progress in its study of the proper seasoning of oak ties, with special reference to those grown in southern lowlands.

Revision of Manual

To obviate the necessity for making extensive calculations whenever comparisons between ties having different first costs or service lives are undertaken, the committee submitted three diagrams giving the relationship between costs per year and the first cost of ties in track for different rates of compound interest, namely four, five and six per cent. The committee recommended that the diagrams be adopted for inclusion in the Manual.

This recommendation was adopted.

Adherence to Standard Specifications

The report on adherence to standard specifications consisted of a description of conditions which the committee found in its inspection of seven commercial wood-preserving plants in Illinois and Ohio to observe 2,000,000 ties accepted by 11 railroads. Comment in the report included reference to the general condition of the yards, cases of improper stacking, the use of irons to control splitting, and the acceptance of ties in sizes not warranted by their dimensions. Examples of the latter were attributed to the fact that the ties were accepted by inexperienced inspectors, and in this connection the committee said that the "notable difference in the work of new men and old men demonstrates that capable inspectors are not everywhere readily available and cannot be trained in a day or a week."

Tie Renewal Averages and Costs

As usual, committee presented tables of tie renewals and costs for 1937 and the preceding five years, these tables having been given preliminary publication in Bulletin 404 (June—July, 1938). These statistics are based on data reported to the Interstate Commerce Commission by railroads in this country and to the association by Canadian carriers. The presence of errors in the data received from the I. C. C. have prompted the committee to make the suggestion that tie renewal figures sent to Washington by the accounting department be checked by the engineering department of each road to insure accuracy.

Dimensions of Ties

The report on the dimensions of ties was confined to a dis-

* Forester, Pennsylvania.

cussion, submitted as information, of the length of crossties and, after a review of present practice in this respect, the comment undertook an analysis of the length of the crosstie as it is related to the four functions of the tie; i. e., for holding the rails to gage, for distributing the concentrated load from the rail base, for supporting the rails in position both vertically and horizontally, and for providing the ballast contact necessary to retard or prevent rail creeping. The relationship of length of tie and the distribution of the load were given particular attention and the committee said that, considering each tie as a beam, a proper distribution of the load on the beam would require ties 10 ft. in length or even longer. Consideration was given to the various factors having an influence on the cost of longer ties, and the following conclusions were submitted:

It is concluded that an increase in supporting power of the roadway may be obtained by an increase in length of ties at less expense than by other means.

It is concluded that, considering the additional tie cost, 8½-ft. ties are a better buy than 8-ft. ties and will give added support out of proportion to the added tie cost.

B. R. Leffler (N. Y. C.) pointed out that further consideration should be given by the committee to the bending action of ties under load and the resulting distribution of the load on the ballast. He suggested that the cost of the increased depth of tie necessary to obtain uniform load in the case of longer ties might offset the advantages possible through increased length.

Replying, Chairman Burton said that the determinations of the committee were based upon practical considerations and what is generally accepted as common knowledge in the action of ties, rather than upon mathematical formulas, which he contended are not as readily applicable in the case of ties as in the design of bridge members.

Report on Buildings

O. G. Wilbur, Chairman*

The committee presented reports on five of its nine assignments, including revision of the Manual; completion reports on the maintenance of wearing surfaces of platforms and floors, air-conditioning of buildings, and layout and test equipment for a railroad laboratory; and material for inclusion in the Manual on improved wearing surfaces for platforms.

Revision of Manual

Under the heading, Revision of Manual, the committee recommended numerous revisions of, and some additions to, the specifications for buildings for railway purposes. These include revision of the paragraph on Force Account Work under General Conditions; the addition of three new paragraphs under Concrete; revision of the paragraph on Materials under Built-up Roofing; revisions in the paragraphs on Materials, Flashings and Skylights under Sheet Metal Work, including the addition of a new paragraph to that on Flashings; numerous revisions in the specifications for Carpentry and Millwork, including the addition of a new paragraph on Partitions; and changes in the specifications for Painting and Glazing, heating systems, and Electric Light Wiring.

The committee's recommendations were accepted.

Maintenance of Wearing Surfaces of Platforms and Floors

Following a brief general statement in which it pointed out that the maintenance of the wearing surfaces of platforms and floors in railway buildings requires consideration of the methods and materials that will give the best wearing surface at the lowest annual cost, the committee undertook separate discussions of the different materials used, namely, wood, concrete, brick and bituminous materials. Under wood platforms the committee reviewed the different methods of prolonging the life of timber floors, and discussed the various woods, preservative treatments and types of construction that are suitable for use in platform repair work.

In its discussion of repairs to concrete, the committee pointed out that, to insure success in patching such surfaces, attention and care must be given to the proper preparation of the old concrete. Consideration was also given to the use of metallic aggregate, wire mesh or expanded metal lath, and bituminous products. With reference to the repair of brick surfaces the committee discussed briefly the making of repairs in brick and the use of various types of resurfacing materials. Under bituminous materials, the committee pointed out that such materials may be repaired in kind following manufacturers' instructions.

* Assistant Engineer, Baltimore & Ohio.

Air-Conditioning of Buildings

The report on air-conditioning was presented under two headings, namely; (a) For use by passengers and employees; and (b) for the storage and treatment of fruits and vegetables. Under the first heading the committee presented a brief discussion of the purposes and objectives of air-conditioning and pointed out that, when installations are under consideration, the investigation should include a study of local building regulations, and the available water and electric power supplies. Factors to be considered in selecting the type of installation to be made were also given attention.

Under the second heading, separate consideration was given to the use of air-conditioning for cold-storage purposes and for the controlled ripening of produce. The discussion of the first of these divisions included consideration of the size of the room, the relative humidity of the air in the storage room, and the duration of time in which fruits can be held in storage. The second division of the subject was given rather extended treatment and included separate discussions of banana ripening and pear ripening. Supplementing this phase of the report was a discussion of the construction of ripening rooms and of the choice of the air-conditioning equipment to be installed.

Also accompanying the report was a tabulation giving the physical requirements for cold storage and ripening of various perishable products.

Improved Wearing Surface for Platforms

In reporting on the Improved Wearing Surface for Platforms, the committee included a classification of the various types of platform surfaces suitable for use around passenger stations, shops and car yards, and piers, warehouses and freight houses. The committee then presented separate discussions of the different platform materials, including wood, brick, concrete, bituminous compounds, wood blocks and steel and iron plates. In each case particular attention was given to the physical properties of the material, the adaptability of different materials to various types of service, and proper methods of application.

This material was adopted for inclusion in the Manual.

Railroad Test Laboratory

Prefacing its report on this subject with a brief discussion of the importance of testing and research the committee went on to discuss the salient features of a properly designed laboratory. Consideration was given to organization, location, layout, physical laboratory equipment, and chemical laboratory equipment, and a floor plan was presented showing the arrangement of a typical railway testing laboratory.

This report was accepted without discussion.

Iron and Steel Structures

R. A. Van Ness, Chairman*

This committee presented a report on revision of the Manual and also a final report, complete with recommended conclusions for publication in the Manual, on different grades of bronzes, to be used for various purposes in connection with iron and steel structures. Progress was reported on the committee's five other assignments.

Revision of Manual

To take the place of material now appearing in the Manual, the committee offered new instructions for the mill inspection of structural steel, consisting of 15 separate instructions, and new instructions for inspecting the fabrication of steel bridges. The latter comprise a total of 42 instructions presented under the following general headings: General; Details of Fabrication; Machine Shop Work; Shipments; and Reports.

The committee also offered new instructions for the inspection

* Bridge Engineer System, Atchison, Topeka & Santa Fe.

of bridge erection. These include a total of 50 instructions presented under the following general headings: General; Traffic; Materials; Records and Reports; Progress and General Conduct of Work; Details of Erection; Movable Bridges; Welded Work; and Cleaning Up Site.

All of these changes were approved.

Grades of Bronzes for Various Purposes

In giving consideration to bronzes for various purposes, the committee reported that it had collaborated with Committee B-5 of the American Society for Testing Materials. The A. S. T. M., said the report, has adopted tentative specifications for bronze bearings and expansion plates to be used in connection with iron and steel structures, and the committee recommended for printing in the Manual a reference stating that cast bronze and rolled bronze bearing and expansion plates shall conform to the tentative specifications of the A. S. T. M.

This recommendation was approved.

Wood Preservation

C. F. Ford, Chairman*

Progress reports, submitted as information, were presented by the committee on six of its nine assignments, while progress was reported in the study of two other subjects, namely, the incising of all forest products material and the determination of the toxicity value of creosote and creosote mixtures. Also a number of recommendations were made regarding Manual material.

Revision of Manual

The committee reported progress in its study of the specifications for treating processes and of specifications for the treatment of wood in the various forms and species ordinarily encountered, but said that sufficient progress has not been made to permit of submitting a revision of present standards at this time. With reference to the specifications for creosote analysis, the committee recommended an editorial revision of the present standard for water determination and the adoption of an alternative method for water determination, which it explained may be found preferable under certain conditions. It was pointed out that this alternative method has been adopted by the American Society for Testing Materials and the American Wood Preservers Association.

These recommendations were approved.

Service Test Records of Treated Ties

In accordance with its custom of past years the committee submitted the usual table showing tie renewals per mile of maintained track for various railroads, which has been revised to include data for 1937. Also included in the report were data covering special tie tests on the Atchison, Topeka & Santa Fe; the Baltimore & Ohio; the Chicago, Burlington & Quincy; the Chicago, Milwaukee, St. Paul & Pacific; the Chicago & North Western; the Canadian National; the Northern Pacific and the Southern Pacific.

Piles Used for Marine Construction

Continuing its practice of past years, the committee reported on the condition of various long-time test installations that have been under observation by itself, the Chemical Warfare Service, the Panama Canal zone, and other collaborators. Also the committee reported on the status of the investigation of marine borers along the New England coast that is being conducted by the New England Marine Piling committee, and discussed the activities of the "Sea Action committee" of England and of studies that are underway in Australia. The following summary of the committee's findings during the year was appended to the report.

"No conclusions are as yet possible as to the relative effectiveness of the various creosotes in the San Francisco tests or of the effect of the poison added to creosote.

"The theory of selective attack by different species on various treatments and different timbers opens a wide field for study and raises a serious question as to how far it is safe to go in using such records as we have of the resistance to attack of treatments or timbers in locations other than those where the records were kept."

* Supervisor Tie and Timber Department, Chicago, Rock Island & Pacific.

Creosote-Petroleum and Zinc Chloride and Petroleum

During the last 15 years the committee has been investigating the effect of preservative treatment by the use of creosote-petroleum and zinc chloride and petroleum, and part of its report this year was devoted to a resumé of previous reports on the subject. For this year it presented tables showing the performance to date of approximately one million ties in test tracks on the Northern Pacific, the Reading and the Santa Fe.

Destruction by Termites and Ways of Prevention

Calling attention to the fact that it had previously reported on the results of a test to determine the efficacy of various soil poisons, the committee reported that it had decided to initiate a second series of such tests. Much of this year's report was devoted to a description of the manner in which the committee plans to conduct the tests and to a listing of the compounds that are to be tested. Brief mention was also made of the extent of termite damage during the past year as reported to the committee, of a survey of termites in Southwest Minnesota by the University of Minnesota, and of a test installation on the Illinois Central.

Effect of Blow-Off on Treated Ties

A report on the effect of locomotive blow-off on treated ties consisted of a detailed description of a test conducted on the Santa Fe to determine the effect on ties of the underneath blow-off of locomotives. For the purpose of this test, 14 ties were removed from track in 1935, seven of which were from locations where locomotives blow-off frequently while the other seven were not subject to the effects of blow-offs. Discussing the results of this investigation the committee said that "notwithstanding surface checking caused by continuous wetting and drying, together with the slight loss of preservative, it is the opinion of the committee that these harmful effects are greatly overshadowed by the economy, convenience and satisfactory results otherwise obtained from the blow-off operation as now generally practiced."

The committee also expressed the opinion that if the blow-off is operated while the locomotive is traveling at a speed of not less than 15 m.p.h., and that if the blow-off is operated intermittently, that is, opened 5 sec., then closed for 5 sec., and alternated in this manner until the required amount of blow-off is obtained, and that if this is done while the locomotive is drifting with the throttle closed, track damage will be much reduced.

Present Practice as to Preservatives Used

As its report on this subject the committee submitted a tabulation summarizing reports from railroads giving their respective practices as of March 1, 1938, regarding the extent to which various preservatives are used.

This part of the report was withdrawn by the committee as a number of errors were found in the tabulation which was an essential part of the report. The report was received without discussion.

Records and Accounts

C. C. Haire, Chairman*

Reporting on eight assignments, this committee offered Manual material pertaining to office and drafting room practices, presented progress reports on five other subjects and reported progress in the study of two other assignments, including revision of the Manual. Continuing its custom of past years the committee included in its report a brief bibliography of books and periodicals pertaining to records and accounts.

Office and Drafting Room Practices

The committee reported that the welding symbols which it offered for inclusion in the Manual at the 1938 convention had been withdrawn in order that the committee might consider

* Engineer Capital Expenditures, Illinois Central.

another code of welding symbols that are being developed by the American Welding Society. During the current year the committee gave consideration to eight subjects, reporting progress on five and submitting detailed reports on three. The latter included (1) methods of reproducing drawings, (2) reduction and enlargement of drawings and (3) methods of folding and punching drawings. To acquire information regarding prevailing methods, the committee submitted a questionnaire to 58 railroads, receiving answers from 35.

In its report on methods of reproducing drawings, the committee submitted detailed information, including cost figures, regarding the three general methods now in use, namely, light-exposure printing, photostating and the photo-lithographic (planograph) process. Passing on to the second subject—reduction and enlargement of drawings—the committee discussed replatting methods and the photostatic method. It also discussed briefly scales of reduction and enlargement.

In considering methods of folding and punching drawings, the committee explained in detail with the aid of drawings, the two methods in general use, one with the binding margin projecting from the top and the other with the margin at the left-hand edge. Methods of folding drawings for storage were also given consideration, although the punching of drawings was disposed of with the statement that it is believed impractical to attempt a standardization of practice.

Regarding each of the three assignments, the committee presented conclusions embodying recommendations concerning the use of the various methods and practices that were discussed. These discussions were submitted as information.

Maintenance of Way Reports and Records

In a brief progress report on maintenance of way reports and records, the committee reported that it had under consideration a form for the analysis of maintenance of way and structure accounts, which allows comparison by accounts of the cost of maintaining the property, expressed in terms of a dollar base and a mileage base, this comparison to be made between divisions or systems.

Valuation

Under this heading consideration was given to four assignments during the year. In accordance with one of these assignments the committee presented a resumé in some detail of developments of the current year in connection with regulatory bodies and courts. It also reported that substantial progress had been made in its study of Valuation. Order No. 3 reports and records to determine if further simplifications are possible.

With reference to its assignment to develop a form of Valuation Order No. 3 report in connection with joint government-railroad projects, the committee said that, regarding the several kinds of highway crossings, difficulties arising as to the proper inventory classification of property had prevented the development of an outline or form for reports. Turning to its assignment pertaining to the development of forms for a record of ballast installations, the committee reported that the development of such a record is primarily dependent on the needs of individual carriers and that, knowing such needs, the problem is a simple one. It also said that, owing to the lack of uniformity in the requirements of individual carriers no general forms have as yet been developed. This report was submitted as information.

Revisions in I. C. C. Classification

Reporting that there have been no changes in the accounting classifications subsequent to its last report, the committee said, however, that the Bureau of Accounts of the commission had released three series of account rulings, namely, Accounting Case Series Nos. 15, 16 and 17. Those rulings that are of interest to members of the association were listed in the report, which was submitted as information.

Avoiding Duplication of Effort

Referring to last year's report, which contained a list of the reports filed by railroads with various state and federal authorities, the committee said that this list had been circulated among accounting officers by the A. A. R. and that recommendations or simplification pertaining to the elimination of such reports had been received for transmission to the department affected. Following submission of a number of such recommendations to the I. C. C. two conferences regarding them were held between railroad officers and representatives of the commission. This report, which was submitted as information, also referred to the survey that was initiated by President Roosevelt to determine the nature, duplication and diversity of reports now required of business and industry by federal agencies.

The report of this committee was received without discussion.

Waterproofing of Railway Structures

J. A. Lahmer, Chairman*

Commenting on a suggestion put forward by the producers of coal tar waterproofing to the effect that the current A. R. E. A. specifications for membrane waterproofing, which includes specifications for plastic cement having an asphalt base, should also provide for the use of plastic cement having a coal tar base, the committee said that this matter is receiving attention and it is expected that the necessary Manual material will be offered next year.

The committee also reported that, at the request of the American Society for Testing Materials, it had examined a revised specification of the A. S. T. M. covering asphalt for saturant and mopping in connection with membrane waterproofing above ground, and said that this specification permits a somewhat lower grade of asphalt than current A. R. E. A. specifications. The report added that the members of the committee are opposed to lowering the ductility requirements for this material, and said that consideration of the matter would be continued.

The report was received without discussion.

Report on Masonry

J. F. Leonard, Chairman†

During the year this committee gave consideration to 14 assignments, several of which were comprised of a number of different parts. Five of the reports presented by the committee were offered as information while a number of revisions in, and additions to, Manual material were recommended in connection with five other assignments. Progress was reported in the study of three other assignments, while, regarding its assignment to revise specifications for overhead highway bridges of the American Association of State Highway Officials, the committee reported that it had received no call for collaboration from that association during the year.

Revision of Manual

The committee recommended a number of deletions, substitutions and additions in Manual material as follows: Deletion of the section on fineness in the specification for high-early-strength Portland cement and of a paragraph relating to the rejection of cement for failure to meet the fineness requirement; deletion of Sections 1, 3 and 13 of the specifications for Portland cement, the addition of a paragraph and note to Section 2, the redesignation of this section as Section 1 and the renumbering of all subsequent sections; withdrawal of Sections 8 to 11, inclusive, in the specifications for standard methods of sampling and testing Portland Cement and the substitution of new requirements for the procedures for chemical analysis; and inclusion in the specifications for standard methods of sampling and testing cement of instructions for the rapid determination of magnesia in Portland cement. Certain additional minor changes were also recommended, including the renumbering of paragraphs, changes in A. S. T. M. designations and deletions and additions of footnotes. The committee's recommendations were adopted.

Design of Plain and Reinforced Concrete

The report on the design of plain and reinforced concrete, submitted as information, consisted largely of a brief discussion of "Isteg" reinforcing bars, this matter being presented under the assignment pertaining to special types of steel reinforcement. The nature and manufacture of these bars were described and reference was made to various tests that have been conducted.

Reference was also made to those phases of this assignment

* Senior Assistant Engineer, Missouri Pacific.
† Engineer Bridges and Buildings, Central Region, Pennsylvania.

pertaining to specifications for composite columns and pipe columns and concrete bridge deck slabs of the non-ballast type, the committee stating that further study of these subjects would be required.

Progress in Science of Concrete Manufacture

Reports were presented as information on two developments in concrete placing, namely; (1) Prestwood, plywood and special fibrous materials for forms and form lining, and (2) standard Portland cement compared with standard high-early-strength Portland cement. Under the first heading, the committee first described the manufacture of plywood and prestwood and gave the range of thicknesses in which these products are available. The remainder of the report was devoted to a discussion of various considerations entering into the use of these products in concrete forms, including reference to the thickness required, extent of possible re-use, preparation of the sheets, construction of the forms, and economic considerations.

In reporting on the second subject mentioned above, the committee first pointed to the differences in the A. S. T. M. specifications for Portland cement and high-early-strength Portland cement, and also mentioned that different brands of cement have different characteristics and that the gap in strength between the two types of cement has been narrowed by the large increase in the early strength of normal Portland cement. Referring briefly to the heat of hydration and to the relative durability of the two cements, the committee went on to say that high-early-strength cement is preferable where early strength and speed are the essentials, but that for non-emergency work the choice between the two cements may depend on a variety of factors.

Specifications for Foundations

The committee presented a set of specifications for pile foundations, consisting of eight articles, of which Article I—Scope, Article II—Purpose and Necessity, Article III—Design, Article IV—Allowable Load on Piles and Article V—Loading Test, were recommended for adoption and publication in the Manual. Articles VI—Types of Piles, VII—Driving, and VIII—Spacing of Piles, were submitted as information.

The committee's recommendation pertaining to the first five articles was adopted.

Lining and Relining Tunnels

The committee explained that its report on the lining and relining of tunnels was preliminary in nature and was designed to set forth the various types of tunnel lining that will be considered in subsequent reports on this assignment. In discussing brick as a tunnel-lining material, the committee pointed out that its use had been almost discontinued in the United States and Canada, although it is used widely abroad. The discussion of brick lining also included reference to first cost, quality and quantity of mortar, compressive strength, resistance to locomotive blasts and resistance to side pressure.

Referring briefly to stone as a tunnel-lining material, the report passed on to a discussion of concrete, it being stated that the use of this material for lining tunnels is now almost universal, due largely to its lower initial cost, adaptability to unusual construction conditions and low cost per service-year life. A preference was indicated for plain concrete as against reinforced concrete. The properties and applications of shotcrete were also given brief consideration.

Specifications for Placing Concrete by Pumping

In reporting on this assignment, the committee offered for approval and inclusion in the Manual specifications for placing concrete by pumping, consisting of 12 paragraphs presented under 6 general headings as follows: Scope, Equipment, Operation, Mixing and Proportions and Duplicate Equipment.

These specifications were adopted without comment.

Vacuum Method of Testing Concrete

In its study of the vacuum method of testing concrete, the committee stated that in addition to studying available literature it had visited the laboratory of a sponsor to witness a demonstration and that it had held a member ready to visit a field demonstration on notification, although no notice of such a demonstration had been received in a period of 18 months. A method of applying the vacuum process of treating freshly poured concrete, as followed by one company, was described in detail and the results of the laboratory demonstration witnessed by the committee were recounted. The committee also summarized the results of tests made on vacuum-processed specimens, and presented a list of the advantages claimed for the process by its sponsors. This report was presented as information.

Specifications for Concrete Culvert Pipe

Pointing out that present approved specifications for reinforced concrete culvert pipe contain design tables in which the data presented are entirely empirical, the committee said that these specifications are intended only for use where the pipe is manufactured and tested as required by the specifications. For application in instances where conditions dictate the use of pipe that is made locally and cannot be tested without undue expense, the committee presented a list of five requirements that must be observed if such pipe is to be considered capable of carrying the assumed loads. With slight editorial corrections, these requirements are the same as those presented last year and were offered for adoption and printing in the Manual. They were so received.

Pre-stressing of Reinforced Concrete

The report on the pre-stressing of reinforced concrete, submitted as information, comprised a discussion of various aspects of the subject. The pre-stressing of reinforcing steel, said the committee, is a means that has been adopted for reducing the tension in reinforced concrete. Various methods of accomplishing this end were described, and the application of pre-stressing to structures in tension and others in compression was discussed briefly. Advantages to be obtained by pre-stressing are treated at some length and a bibliography of current literature on the subject is included.

Other Subjects

Progress in study was reported by the committee on its assignments having to do with the maintenance of contact with the Joint Committee on Concrete and Reinforced Concrete, the rating of reinforced concrete bridges, and progress in cement manufacture and testing.

Yards and Terminals

Hadley Baldwin, Chairman*

This committee recommended a number of revisions in the Manual, offered new specifications for railway scales as a substitute for corresponding material in the Manual, reported progress on three of its assignments, and presented progress reports on two other assignments. The latter dealt with classification yards and the substitution of outlying yards and facilities for similar facilities in cities where land values are high. The committee also presented its usual bibliography on subjects pertaining to yards and terminals.

Revision of Manual

The committee recommended that the title of Section 2411 be changed from "Elevators and Escalators" to "Elevators and Moving Stairways." It also asked that the words "or escalators" be deleted from Paragraph (b) of this section, that the words "moving stairways" be substituted for the word "escalator" in Paragraph (d), and that a number of changes be made in Paragraph (3). The latter included insertion of the words "Moving stairways or" before the word "Escalators" at the beginning of the first sentence, and substitution of a new sentence for the second sentence, so that the paragraph will read: "Moving stairways or escalators have a carrying capacity of approximately 33 passengers per foot of width per minute. They are being used successfully in both suburban and through passenger service."

All the committee's recommendations were adopted.

Scales Used in Railway Service

Reporting on the use of scales in railway service, the committee submitted proposed revisions of two sections of Chapter 14 of the Manual. The first of these was offered under the title "Speci-

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fications for the Manufacture and Installation of Two-Section, Knife-Edge Railway Track Scales—1939," and as a substitute for materials now appearing in the Manual under a corresponding title. The committee pointed out that the new material was first submitted as information in 1937 and that it differs from present Manual material chiefly in editorial arrangement, and to some extent in technical detail.

These specifications were presented under the following sectional headings: Introduction, Capacity, Plans, Working Stresses and Formulas, Length of Scale, Scale Levers, Pivots and Bearings, Nose Irons, Lever Fulcrum Stands, Loops and Connections, Checks, Weighbeams and Accessories, Anti-Friction Points and Plates, Clearances, Interchangeability, Weighbridges, Transverse Beams Supporting Approach Rails, Protection From Corrosion, Approach Rails, Decks, Exclusion of Dirt and Precipitation, Lighting, Location and Elevation, Foundation and Pit, Setting of the Scale, Weighbeam House, Sensibility Reciprocal, and Tolerance.

The committee also proposed three revisions of that material in the Manual entitled "Specifications for the Manufacture and Installation of Motor Truck, Built-in, Self-contained and Portable Scales for Railway Service—1936." It stated that experience in the application of these specifications had suggested these revisions, and recommended that they be approved.

All recommendations of the committee pertaining to scales were accepted.

Use of Outlying Yards and Facilities

In its report on the substitution of outlying yards and terminals for yards and other large facilities in cities where land values are high, the committee first reviewed the problems and considerations involved in expanding facilities in congested areas to handle increased traffic. Increasing business following the slump of 1921 soon overtakes many railroad terminals, said the committee, and it was then that the difficulties of enlarging or revamping facilities in the existing locations became apparent.

This situation caused consideration to be given to the use of outlying yards and facilities and to collect information on this subject the committee submitted a questionnaire to 69 principal railroads in the United States and Canada. Answers to the questionnaire revealed 19 instances in which outlying facilities had been constructed to replace facilities of a similar type in congested areas. Where the new outlying facility is being operated, said the committee, it is reported that service to local shippers has been improved and traffic through the terminal has been expedited.

The committee recommended that in each terminal a study should be made to develop the facts regarding the existing facilities, the method of operation and the traffic handled. Among the subjects that should be given consideration are, (1) obsolescence or inadequacy; (2) consolidation of separate facilities (such as engine terminals and train yards); (3) consolidation of the operation of several small yards into a new facility, confining the small yards to zone switching operations; (4) coordination with other railways; (5) delays to road trains; (6) delays to switching movements; (7) delay in interchange; (8) change in method of operation; (9) public body regulation, such as switching restricted to certain periods of the day, street crossings, grade separations, smoke abatement.

For consideration when studies are being made in terminal areas to develop the most economical and efficient plans for the future, the committee listed nine things to be considered when developing plans for a new facility, six possible advantages of new outlying facilities, and five possible disadvantages of new outlying facilities. Considerations when developing plans for a new facility include, (1) service to shipper or consignee; (2) ratio of fast trains to slow trains handled; (3) possible delays at outlying facility and extra handling of cars; (4) increased switching at outlying facilities, (a) for local business and (b) to reduce switching at on-line terminals or division points; (5) possible readjustment of road train schedules; (6) determination of operating procedure for new outlying facilities; (7) limitation of traffic at inlying facility to that requiring preferred handling and running fast trains direct; (8) limitation of facilities to normal requirements with provisions for nominal future expansion; (9) complete diagnosis to determine whether some exterior condition is responsible for or contributes to the inadequacy of the inlying facilities, such as inefficiency and unreliability or road power and switch power, quality and quantity of water and fuel supplies, capacity of main line and arrangement of facilities.

Among the possible advantages of new outlying facilities are included, (1) consolidation of forces; (2) improved interchange; (3) reduction in road-train time; (4) better classification of outbound road trains thereby reducing the amount of switching at intermediate terminals and division points; (5) new facilities are modern and result in economies through efficiency; (6) potential value of space occupied by inlying facility for industrial sites and other purposes.

Among the possible disadvantages of new outlying facilities are included (1) cost of the facility; (2) increase in delivery time; (3) increased local switching and transfer movement; (4) necessity for increased classification at intermediate terminals and division points to block inbound trains for faster terminal distribution; (5) traffic loss on account of delay of small amount of traffic effecting a particular industry's business and penalizing that industry at other points.

Classification Yards

For its report on classification yards, which was submitted as information, the committee gave special consideration to the hump end of the receiving yard. It recommended that the track arrangement in yards should be such as to permit incoming road engines to be released quickly and with minimum interference with humping operations, and presented suggestions for accomplishing this end.

These suggestions included the following four principles that should be embodied in a classification yard: (1) Provision for a hump runaround track for handling cars that do not require classification over the hump; (2) the gradient approaching the summit of the hump should be adverse and sufficient to permit the cars to be uncoupled readily; (3) the throat of the receiving yard should be located as close as possible to the hump summit; (4) it is advisable to have at least two car lengths of tangent ahead of the hump, this being essential if the classifications yard is equipped with car retarders or with scales on the hump.

The committee also pointed to the recent trend toward the practice of making up trains that can be run to destination through or past intervening yards without classification, so far as this is possible. Where this is not possible for the entire train, part of the train may be handled through the yard without classification, thus making a "hump run-around track" a desirable feature of the yard.

The report also discussed the considerations governing the gradient through the receiving yard; the factors tending to fix the distance between the throat of the receiving yard and the summit of the hump; and the desirability of having a certain amount of tangent track ahead of the hump.

In accordance with its usual practice, the committee presented a bibliography of published articles, papers and books dealing with passenger stations and terminals; freight stations, yards and terminals; and rail and water terminals.

The three subjects in which the committee reported progress in study included those on arrangement of tracks and facilities to meet the demands of internal combustion and electric locomotives; auxiliary yard facilities and appurtenances; and the adaptation of enginehouses, shops and engine terminal layouts for handling oil-electric locomotives and rail cars.

Economics of Bridges and Trestles

Arthur Ridgway, Chairman*

The report of this committee dealt with the comparative economic value of steel, treated timber and concrete in bridges, trestles and viaducts under various conditions of service, with due consideration to the relative influence of durability of materials and obsolescence of property. Pointing to the fact that the Manual now contains conclusions pertaining to this subject that it had offered as the result of previous study, the committee recommended two additional conclusions for publication in the Manual as follows:

4. The physical characteristics of the three kinds of material differ so widely that each has its field of economic usefulness

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to the exclusion of others, and all are economically essential for the particular purposes for which they are peculiarly fitted.

5. The varied requirements of bridges, trestles, and viaducts are such that no precise and universally comparative values can be assigned to the economic employment of steel, concrete and treated timber in such structures.

These additional conclusions were adopted.

The committee also offered for inclusion in the Manual economic principles pertaining to this subject. The basic aspect of these principles is the equation: Economy = (Utility) — (Cost), in which "Utility" is a group of three values consisting of the utility of the project, the security of its readiness to serve its purpose and the appearance or esthetic value of the complete structure. Each of these factors, as well as the various components of "cost" are explained in detail. A brief discussion of the physical properties of timber, concrete and steel is also embodied in the set of economic principles. This additional manual material was adopted.

Wood Bridges and Trestles

H. M. Church, Chairman*

During the year this committee gave consideration to 11 subjects. In its report it made recommendations for revision of the Manual, presented progress reports on five of its assignments, and reported progress in study on four subjects. With respect to an assignment pertaining to simplification of grading rules and classifications of timber for railway uses, the committee reported that a proposed revision of American Lumber Standards was received and suggestions for its improvement submitted to the National Bureau of Standards.

Revision of Manual

Under Revision of Manual, the committee, for the sake of uniformity, recommended minor editorial revisions involving substitution of the word "piles" for "piling." It also offered certain corrections in the table of dimensions of cedar piles for highway bridges in order to bring this table into conformity with dimensions adapted by the American Society for Testing Materials. These changes were approved.

Overhead Highway Bridges

In its report on overhead wood or combination wood and metal highway bridges, the committee observed that any structure carrying highway traffic, whether on a public or a private road, should be designed, constructed and maintained in accordance with the standards and practices of the state in which the bridge is located. It also stated that the subject should properly include all highway bridges of timber, whether "overhead," as the assignment states, or otherwise. In view of these and other considerations, which it discussed briefly, the committee recommended the adoption and printing in the Manual as recommended practice of the following statement: It is recommended that the standard specifications for Highway Bridges of the American Association of State Highway Officials adopted in 1935, or current revisions thereof, be used, subject to the approval of the railway company as to clearances, foundations and construction practices. This recommendation was approved.

Relationship Between Hammer and Pile

In a progress report in its assignment pertaining to the relationship between the energy of a pile-driving hammer and the weight or mass of the pile for proper driving, including concrete piles, the committee first discussed general considerations bearing on the subject and then stated that, as a general rule, piles should be driven with the heaviest hammer that, in the judgment of the engineer, can be used to secure maximum penetration without appreciable damage to the pile. It also discussed briefly principles underlying the use of steam hammers and gravity hammers. The committee then presented a set of specifications for driving wood piles for study and criticism pending their submission for adoption and publication in the Manual.

In its discussion of steam hammers for driving concrete piles, the committee stated that the hammers shall have sufficient weight and power to develop an energy per blow at each full stroke of the piston of not less than 3,500 ft. lb. per cubic yard of concrete contained in the pile to be driven. The total energy developed by the hammer shall be not less than 12,000 ft. lb. per blow. For driving wood piles the weight of the striking part of the hammer should be not less than the weight of the pile to be driven.

The committee further stated that, in general, the minimum weight of the entire hammer and of the striking part and the length of the stroke should, where practicable, be specified for each project. Where hard driving is encountered, it may be necessary to reduce the length of the stroke to avoid injury to the pile.

The committee also recommended that when driving either concrete or wood piles with gravity hammers, the weight of the striking ram be not less than 3,000 lb. and that the drop be so regulated as to obtain the desired penetration without appreciable injury to the pile.

Objection was raised to the provision for splicing piles and this clause was remanded to the committee for further study.

Specifications for Overhead Highway Bridges

The committee reported that it had thoroughly reviewed the specifications of the American Association of State Highway Officials for overhead highway bridges and said that the portions relating to wood construction are such as to result in a satisfactory highway bridge. This report was offered as information with the recommendation that the subject be discontinued.

Fireproofing Wood Bridges and Trestles

Following a brief discussion of general principles pertaining to the fireproofing of wood bridges and trestles, the committee expressed the hope that this preliminary report would invite general attention and that suggestions would be received for improved methods and designs in use for the protection of outdoor wood structures. The committee also reported that it had grouped fire barriers into four classifications as follows: (1) Earth fill within long trestles; (2) reinforced concrete piers on concrete pile bents; (3) fire-resistant deck; and (4) facing bents with fire-resistant materials. The application of these methods were illustrated by drawings which were presented to invite discussion and suggestions for further study.

Tar and Asphalt Compositions for Wearing Surfaces

In the committee's report on the use of tar and asphalt compositions for wearing surfaces on wood floored highway bridges, this subject was given extended treatment. The report first discussed the general requirements of wood floors for this purpose and then gave consideration separately to the preparation of single-plank floors, double-plank floors, vertical laminated floors, grooved laminated floors and saw-tooth laminated floors.

Instructions were given for the construction of tar mat surfaces and of asphalt mat surfaces, the instructions including reference to both the mixed method and the penetration method for the latter type of floor. Similar instructions were given for the use of bituminous cut-backs and asphalt emulsion; cold asphalt concrete, liquefier type; and cold-lay tar-concrete, two-course construction. This report was offered as information.

Other Subjects

The committee reported progress in its studies of the design of wood trestles for heavy loadings, of the bearing power of wood piles, of the improved design of wood structures to give longer life with lower cost of maintenance, and of the design of fastenings for timber structures, including metal joint connectors. The report was received without further discussion.

RECOMMENDATION OF AN ALL-INCLUSIVE TRANSPORT BOARD to have control even over private highway vehicles is the principal feature of a report made by a royal commission appointed in July, 1937, to study transportation in South Australia. Other features of the report suggest enactment of a bill to place the railways department of the state under the control and management of a state board of directors and create a transport board composed of men not representative of the various transportation agencies to have control over all highway vehicles.

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T. E. Rodman
President

H. H. Talboys
President-Elect

C. H. White
Secretary

N. R. A. A. Presents Effective Exhibit at Chicago

74 companies participate in display of products used in railway construction, maintenance and signaling

COINCIDENT with the conventions of the American Railway Engineering Association and the Signal section, Association of American Railroads, in Chicago during the week of March 13, the National Railway Appliances Association held a highly interesting and successful exhibit at the International Amphitheatre on March 13 to 16, with 74 member companies participating. It was the twenty-eighth time that this association has exhibited in connection with an A. R. E. A. annual meeting, and while the number of exhibitors was not as large as during certain other years, this was more than offset by the unusually high standard of the individual exhibits.

Again the exhibit as a whole was broad in scope, with many features of interest to those in the track, bridge and building, water service and signal departments, and afforded them an opportunity to observe the developments in products and equipment designed for their use in a way that cannot be equalled at any other time during the year. It was the second consecutive year that the exhibit was held in the International Amphitheatre, to which it was transferred last year because of the larger and more modern space for display purposes, accompanied by favorable auxiliaries in the way of meeting rooms and dining facilities.

Through the courtesy of the N. R. A. A., free, chartered bus service was again provided between the two convention hotels and the Amphitheatre on a frequent schedule during the exhibiting hours to provide maximum convenience for railway officers attending the exhibit. More than 700 manufacturers representatives were on hand at the exhibit, to receive visitors and to explain the merits and operating details of their products, many of which were new and on display for the first time, or improved materially during the last year. By the time the exhibit closed on Thursday afternoon, more than 8,000 persons had been admitted to see it, these including, in addition to those attending the conventions, many supervisory railway officers from Chicago and vicinity, and a considerable number of purchasing and stores department officers who had come to the city for this purpose in conjunction with committee meetings of the Purchases and Stores division, A. A. R.

The officers of the N. R. A. A. who were charged with the responsibility for arranging and conducting the exhibit this year were as follows: President, T. E. Rodman (Maintenance Equipment Company) Chicago; vice-president, H. H. Talboys (Nordberg Manufacturing Company) Milwaukee, Wis.; secretary, C. H. White (Industrial Brownhoist Corporation) Chicago; treasurer, J. S. Hutchins (Ramapo Ajax Div., American Brake Shoe & Foundry Company) Chicago; Directors—Jess Mossgrove, Austin-Western Road Machinery Co., Aurora, Ill.; Thos. O'Leary, Jr., Johns-Manville Sales Corporation, Chicago; R. B. Fisher, Buda Company, Harvey, Ill.; W. J. Hanna, Republic Steel Corporation, Chicago; R. C. Flodin, International Harvester Company, Chicago; and C. D. Young, Metal & Thermit Corporation, Chicago.

At the annual meeting on March 14, President Rodman, reviewed the operations of the organization for the year, and called special attention to the substantial aid and encouragement that had been extended by both the American Railway Engineering Association and the Association of American Railroads in perfecting the arrangements for the exhibit. He stated that while the number of exhibitors was less than in 1938, the expenditures were enough less to permit a 5 per cent refund to all exhibitors. He also commended the contact committee for the work it had done in connection with the proposal to hold the conventions of the several engineering and maintenance associations during a limited period of the year and to combine the exhibits now

presented separately at each convention, so that it would be possible to serve all of them with a single exhibit. He said that the work of this committee will be continued.

A preliminary report of the treasurer indicated that after all expenses have been paid, including the refund, a balance of $30,554.44 will remain. Secretary and Director of Exhibits, C. H. White, reported that there are now 120 members in the association.

In the election of officers, Mr. Talboys was advanced to the presidency; R. B. Fisher, The Buda Company, was elected vice-president; and Mr. White and Mr. Hutchins were re-elected secretary and treasurer, respectively. E. D. Cowlin, Eaton Manufacturing Company—Reliance Spring Washer Division, was elected a director for one year to fill the unexpired term of Mr. Fisher. Directors for three years were: C. E. Ward, U. S. Wind Engine & Pump Company, and V. E. McCoy, National Aluminate Company.

Exhibiting Members

Air Reduction Sales Co., New York; oxygen and acetylene gas welding and cutting apparatus and supplies, electric arc welding machine and electrodes, literature, cropping rail ends with radiagraph, demonstration of rail-end hardening with gas heat-treating machine, samples of rebuilt hand tools, rebuilt switch point, fabricated offset angle bar, specimens welded pipe; C. B. Armstrong, A. W. Brown, J. W. Crelly, C. A. Daley, J. T. Gillespie, Jr., H. A. Hocking, J. W. Kennefic, J. W. Knowles, L. T. McDowell, R. T. Peabody, U. F. Portel, H. L. Rogers, E. F. Turner, E. J. Walters, M. Weist, D. J. Williams and I. B. Yates.

American Car & Foundry Co., New York; automatic electric steel-bar heater, electric rivet heater, electric metal heaters for heat treating; W. J. Bisset, F. C. Cheston, H. C. Cheston and A. G. Wood.

American Fork & Hoe Co., Cleveland, Ohio; shovels, spades, scoops, axes, hammers, scythe, brush hooks and weed cutters; H. C. Branahl, C. C. Connolly, George L. Dunn, S. L. Henderson, A. Milligan, J. J. Nolan, R. T. Pinder, F. J. Reagan, John Skeel, and R. J. Whelan.

Association of American Railroads, Washington, D. C.; motion pictures showing progress in rail transportation.

Barco Manufacturing Co., Chicago; stove, gas hammers, tie tampers, flexible pipe joints; C. E. Allen, W. J. Behlke, B. H. Ferguson, C. O. Jenista, L. J. Lytle, C. L. Mellor, and F. B. Nugent.

Buda Co., Harvey, Ill.; track jacks, tie tampers, rail bender, bumping post, car stops, track liners, re-railers, bonding drill, track drill, section and inspection motor cars, earth drill, crossing gate, tool grinder, switch stands, tie spacers, gages, levels, Diesel engine power unit, hydraulic jacks; H. C. Beebe, R. M. Blackburn, H. S. Brown, E. D. Conant, J. S. Dempsey, R. B. Fisher, J. J. Gard, F. L. Gormley, G. W. Hoover, R. K. Mangan, C. T. Miller, G. A. Secor, L. O. Stratton, E. H. Walker and C. W. Wood.

Chipman Chemical Co., Inc., Bound Brook, N. J.; chemical weed killer, photographs of spraying equipment; R. N. Chipman, N. S. Leavitt, A. A. Murphy and I. J. Strain.

Cleveland Frog & Crossing Co., Cleveland, Ohio; Odenkirk switch stands; L. E. Connelly, J. A. Donahey, G. A. Peabody and H. I. Prentice.

Cleveland Tractor Co., Cleveland, Ohio; tractor with overhead shovel and bulldozer; L. T. Burwell, T. D. Crowley, J. J. Gallagher, J. W. Montigney, T. G. Moore, R. W. Payne and J. W. Vogler.

Crerar, Adams & Co., Chicago; rust preventive, portable hydraulic units, jacks and presses, tie squeezer, handles for track tools, die starter, track and bonding drills, demolition tools, pipe bender, knockout punches, pipe wrenches, fire extinguishers, tool grinders, car cleaner, crayons, tools, air compressors, track shovels, tool handles, hydraulic culvert and pipe pushers; R. Besant, Geo. J. Doyle, Wm. Ferguson, Adolph Hawkinson, Al. Kapola, Irving Poehler, W. S. Schulz, J. K. Stewart, Hugh Stringham and J. M. Temple.

Cullen-Friestedt Co., Chicago; anti-slip rail tong, moving pictures of rail crane, clamshell and lifting magnet; W. C. Bamber, K. J. Beller, L. B. Beraux, C. J. Bronez, E. V. Cullen, F. J. Cullen, F. P. Cullen, T. G. Frazee, G. H. Goodell, W. C. Irwin, R. W. Jamison, F. L. Kendit and J. F. Leonard.

Dearborn Chemical Co., Chicago; water treating equipment, pumps, chemicals, rust preventives, water testing equipment, chemical proportioning pumps, signal foam-meter, process for corrosion prevention; F. J. Boatright, Don Bodishbaugh, L. D. Brown, G. R. Carr, R. A. Carr, Robert F. Carr, R. F. Carr, Jr., W. Carrick, E. M. Converse, J. A. Crenner, E. R. Glover, L. O. Gunderson, W. H. Hinsch, F. B. Horstmann, J. F. Johnson, S. C. Johnson, Mark McBrian, R. J. Maginn, R. O. Milnes, A. C. Moeller, A. M. Novak, R. L. Oliver, C. C. Rausch, A. H. Reynolds and B. H. Stone.

DeSanno & Son, A. P., Inc., Philadelphia, Pa.; abrasive wheels and abrasive cutting machine, literature; D. F. Madigan, A. E. Peterson, E. J. Rohan and W. K. Whelan.

Paul Dickinson, Inc., Chicago; smoke jacks, chimneys for small buildings, roof and deck drains, roof ventilators (full size and models), exhaust heads; A. J. Filkins, William Harrison and H. Knutson.

Duff-Norton Manufacturing Co., Pittsburgh, Pa.; track jacks, automatic lowering jacks, ball-bearing self-lowering jacks, standard speed jacks, air-motor-operated power jacks, sidelift track jack, journal jack, tie spacer, track lining jack, bell base screw jacks; D. F. Evans, Walter Floyd, J. Gilchrist, George Mayer, A. Roberts, Frank Schwerin, C. N. Thulin and E. E. Thulin.

Eaton Manufacturing Co. (Reliance Spring Washer Division), Massillon, Ohio; spring washers, rail bonding washers, locomotive spring washers; E. D. Cowlin, E. C. Gross, H. J. McGinn, R. L. Shireman, and A. H. Weston.

Elastic Rail Spike Corp., New York; elastic rail spike; Charles Bernuth, O. M. Bernuth, W. A. Fisher, A. C. Jack and B. Kuckuck.

Electric Railway Improvement Co., Cleveland, Ohio; signal bond and equipment for its installation; P. T. Bevers, E. B. Moore and L. J. Rinker.

Electric Tamper & Equipment Co., Ludington, Mich.; electric vibratory tampers, tooth-tip tamper blades, electric generator sets, vibrators for concrete placement, spot tamper outfit, literature; G. E. Cartier, H. W. Cutshall, Corwill Jackson, Raymond Johnson, E. R. Mason, L. S. Osborn, G. F. Swarthout, G. L. Walters, J. Webb and M. S. Westlund.

Evans Products Co., Detroit, Mich.; Auto-stop; C. L. Fortinberry, W. M. Husson, E. J. Jones, C. J. Mock and S. M. Nampa.

Fairbanks, Morse & Co., Chicago; platform and dial scales, parts for motor cars, heavy and light section cars, patrol cars, welded and bolted steel wheel, one-piece welded steel wheels; L. T. Allis, W. F. Anderson, D. L. Arnold, E. P. Chase, R. V. Cook, E. J. Coverdale, J. F. Cruikshank, C. T. Fugitt, E. C. Golloday, W. R. Grant, H. L. Hilleary, E. F. Kultchar, R. F. Lane, D. K. Lee, C. G. Mahana, W. L. Nies, C. B. O'Neil, J. W. Prewitt, C. A. Rauch, H. E. Vogel and C. H. Wilson.

Fairmont Railway Motors, Inc., Fairmont, Minn.; gang cars, standard section cars, inspection cars, light section cars, bridge and building cars, heavy-duty cars, weed mower; George Adams, C. P. Benning, C. W. Brhel, W. D. Brooks, K. K. Cavins, C. J. Dammann, W. G. Day, D. E. Doolittle, I. N. Eustis, A. R. Fletcher, M. R. Gorman, C. H. Johnson, W. F. Kasper, N. McDonald, J. T. McMahon, G. E. Neffeler, V. Pagett, R. W. Payne, C. L. Rager, W. H. Ripken, H. A. Sly, H. M. Starrett, Ira Sublett, L. D. Whitaker and W. M. Williamson.

Fansteel Metallurgical Corp., North Chicago, Ill.; voltage stabilized transformers and rectifiers; R. B. Arnold, C. G. Howard, H. Humes, G. Ramsey and J. Sola.

Hayes Track Appliance Co., Richmond, Ind.; bumping post, wheel stops, moving exhibit of derail; Norman E. Caskey, S. W. Hayes, H. J. Mayer, P. C. McClure and R. J. Parshall.

George M. Hogan, Chicago; Right-of-way tractor mowing machine, moving pictures of mowing machine in action on railroad; J. T. Flynn, K. E. Gifford, G. M. Hogan, J. E. Hogan, H. S. Johnson, A. F. McCoole, D. L. O'Brien and S. H. Smith.

Homelite Corp., Port Chester, N. Y.; portable generators, portable pumps; R. J. Edbrooke, A. G. Straetz and Nelson Thompson.

Hubbard & Co., Pittsburgh, Pa.; track tools, nut locks and spring washers; J. F. W. Kruse, L. J. Wenzel and John Wincrantz.

Hunter Manufacturing Corp., New York; emergency light; E. A. Arvesen and H. A. Morean.

Industrial Brownhoist Corp., Bay City, Mich.; moving pictures of ballast cleaner, car dumper and locomotive crane; T. G. Frazee, J. Frundt, Hoyt E. Hayes, A. P. Lyvers and C. H. White.

Ingot Iron Railway Products Co., Middletown, Ohio; culverts, asbestos-bonded paved pipe, multi-plate pipe and arches, perforated pipe, spiral welded pipe, metal crib wall, tunnel liner, portable air pipe, helical perforated pipe, exhibit of drainage products in action; R. Y. Barham, E. L. Campbell, E. T. Cross, William Crout, W. P. Greenawalt, L. E. Jones, W. J. Kelley, W. P. Lipscomb, M. C. Patton, N. A. Powell, W. H. Spindler, J. R. Wilkes and J. L. Young.

International Harvester Co., Chicago; photographs, Bucyrus-Erie bull-grader, Diesel tractor shovel; J. S. Erskine, R. C. Flodin, A. C. Flowers, William Hensel, Neal Higgins, S. E. Houston, Don Hipskind, Don Jones, A. F. Mohr, M. F. McCarthy, W. M. Parrish, M. F. Peckels, K. O. Schreiber, J. F. Sims and A. W. Turner.

Johns-Manville Sales Corp., New York; roofing, transite pipe, asphalt mineral-surface bridge plank, expansion joint materials, fire-proof building materials, insulation, friction materials, refractories, asphalt tile flooring, soft mechanical packing, photographs of transite products; P. R. Austin, C. E. Bryant, C. S. Clingman, J. S. Doyle, S. H. Flannagan, W. J. Hennesy, J. D. Johnson, Thomas O'Leary, Jr., L. Papineau, A. C. Pickett, H. R. Poulson, W. W. Prosser, R. P. Townsend, J. H. Trent and F. C. Vandercort.

O. F. Jordan Co., East Chicago, Ind.; movies of Jordan spreader, model of Jordan spreader, photos of Jordan spreader; A. W. Banton, O. L. Champion, J. C. Forbes, H. M. McFarlane, W. J. Riley and C. W. Shipley.

Kalamazoo Railway Supply Co., Kalamazoo, Mich.; heavy and light-duty motor cars, pressed steel and wood center motor car wheels, track gages, track level; H. J. Armstrong, L. Boswell, C. W. Croasdill, R. E. Keller, F. E. McAllister, Robt. McAllister, E. C. Poehler, P. J. Robischung and Z. A. Toye.

Lehon Co., Chicago; prepared roofing, asphalt shingles, asbestos shingles, roof coatings, rail joint plug to protect rail from brine deterioration; John Eipper, Tom Lehon, E. A. Leonard, R. J. Mulroney, J. W. Shoop and H. A. Wolfe.

Lewis Bolt & Nut Co., Minneapolis, Minn.; hook bolts, guard rail lag screws, timber bolts, cribbing bolts, guard rail bolts, washer nuts; R. B. Hill, H. W. Johnson, Joseph Leonard and C. E. Murphy.

Maintenance Equipment Co., Chicago; rail and flange lubricator, switch-point protector, blue-flag derail, pictures of three-man rail layers; S. E. Bates, D. M. Clarke, E. Overmier, T. E. Rodman, R. J. Shanahan, G. L. Springborn and P. A. Wells, Jr.

Mall Tool Co., Chicago; 5-hp. gasoline rail grinder, cross slotting attachment, surface grinding and switch point and stock rail grinding attachments, also electric vibrator, saws and drills, 3-hp. multi-purpose b. & b. unit with vibrator, chain saw, sump pump, wire brush, electric drills, and pole gainer; W. W. Chapman, M. H. Haas, J. W. Innes, F. E. Kilbourn, A. W. Mall, F. McGonigle, M. Rehnquist and William Sanders.

Master Builders Company, Cleveland, Ohio; non-shrink cement for grouting and concrete repairs, water-reducing agent for concrete, material for armoring floors, quick-setting materials for tunnel linings, literature on masonry maintenance; J. M. Stone and B. R. Wood.

Metal & Thermit Corp., New York; Thermit pressure welding equipment for rail joints, pressure and compromise weld joints; Robin B. Bradley, C. M. Lippincott, Anton Lucas, Wm. Sharav, J. B. Tinnon, H. T. Thompson, L. G. Vock and C. D. Young.

Morden Frog & Crossing Works, Chicago; manganese insert frog, taper rail, compromise joint, adjustable rail brace, foot guard, switch accessories; E. C. Argust, R. A. Brown, T. F. Carlin, W. J. Church, W. Homer Harts, Chas. Kane, G. F. Killmer, Lyle Martin, C. E. Murphy, J. B. Peeble, L. C. Reebs and W. J. Wilmot-Gilbert.

Morrison Railway Supply Corp., Buffalo, N. Y.; wood preservative, grinding wheels, welding rods, switch point guard, literature on welding service; G. J. Diver, R. L. Morrison, W. F. Pickham and E. Smith.

National Aluminate Co., Chicago; chemical proportioning pump, cut-out model of water meter and contact box, new type of sensitive flow switch, phototester for rapid analysis of water using principle of the electric eye, embrittlement testing apparatus, unit chemical vat with all proportioning and electrical control equipment integral, sectional chemical proportioner, turbidity meter in operation, classification and silica removal demonstrator; W. R. Anthony, C. M. Bardwell, R. A. Bardwell, B. D. Barger, C. A. Brown, J. L. Callahan, L. E. Elliott, P. W. Evans, R. E. Falkinburg, C. B. Flint, J. L. Gibboney, R. V. Lucas, V. E. McCoy; A. F. McNeil, H. A. Marshall, E. M. Miller, H. H. Richardson, H. D. Shaw and T. G. Windes.

National Carbide Corp., New York; acetylene light and lantern, carbide flare light, motor car headlight; C. B. Armstrong and J. T. Gillespie, Jr.

National Lead Company, New York; Dutch Boy red and white lead, cinch anchorage special ties; T. Ancliffe, J. O. W. Belt, R. D. Baker, W. S. Carlisle, Hugh Millen and J. O. Meyer.

National Lock Washer Co., Newark, N. J.; spring washers; F. B. Archibald, R. L. Cairncross, George Prest, W. H. Reaves and G. E. Webster.

Geo. P. Nichols & Bros., Inc., Chicago; roller bearing turntable drive, model of transfer table, duplex turntable collector, control panel; B. F. Goldman, S. F. Nichols, S. H. Nichols and G. M. Shearer.

Nordberg Manufacturing Co., Milwaukee, Wis.; surface grinder, utility grinder and accessories, lag-screw driver, track drill, adzing machine, power jack, spike puller, power track wrench precision grinder; W. E. Bugbee, C. P. Clemens, W. W. Fitzpatrick, C. K. Jensch, Eugene Larson, R. W. Payne, F. M. Read, Will Reaves, S. H. Smith, H. H. Talboys, Halwin Wegner and F. S. Wonham.

Oxweld Railroad Service Co., Chicago; Live demonstrations of flame-hardening rail ends, welding equipment, samples of welded rail, switch points, compromise joints, floodlights, heat-treated joints; Lem Adams, M. C. Beymer, G. P. Bogert, M. Burnett, Jr., W. E. Campbell, E. Cordeal, F. J. Duffie, F. Finsthwaite, A. F. Garberding, E. B. Hall, Jr., H. W. Hicks, S. Hopkins, P. Hunter, Jr., May Kinney, Wm. Leighton, Wm. Latthes, B. Miller, H. Miller, G. B. Moynahan, D. H. Pittman, J. H. Rodger, L. C. Ryan, H. W. Schulze, J. C. Stephenson, F. C. Teichen and J. E. Winslow.

P. & M. Company, Chicago; rail anti-creeper, bond wire protector, tie plates, rail-free tie plate assembly, rail tension clips, rail free clips; S. M. Clancey, W. G. Cunningham, G. W. Dunn, J. J. Gallagher, D. T. Hallberg, P. H. Hamilton, G. E. Johnson, J. E. Mahoney, W. A. Maxwell, P. W. Moore, Jr., G. E. Olson, R. W. Payne, F. A. Preston, W. H. Reaves, M. K. Rupert, G. T. Willard and Frank Woods.

Pettibone Mulliken Co., Chicago; spring frog model-rail lubricator, full-size crossing, mechanical switch, safety switch stand, shoulder bolts; J. H. Asselin, D. A. Bonitz, W. F. Brietzke, A. R. Hearl, C. A. Johnson, C. F. Lanberg, G. R. Lyman, W. E. Olds, J. D. Potts, G. J. Slibeck and J. M. Trittenbach.

Philadelphia Steel & Wire Corp., Philadelphia, Pa.; display of spring washers; Waldo E. Bugbee, John E. Hogan, John M. Newkirk, Stanley H. Smith, Adrian Walker, C. C. Washer and W. F. Weber.

Pocket List of Railroad Officials, New York; copies of publication; Harold A. Brown and B. J. Wilson.

Power Ballaster Company, Chicago; photographs, working model of cribbing machine, motion pictures, power track ballaster; W. E. Bugbee, V. Coble, Ralph Payne, F. H. Philbrick and Stanley Smith.

Rail Joint Co., New York; standard and insulated joints, controlled or intermittent bearing joint, armored insulated joint, alloy compromise joints, tight center joint, insulating fibre; W. Acker, V. C. Armstrong, E. W. Backes, Alex Chapman, E. A. Condit, W. E. Gadd, H. C. Hickey, G. H. Larson, J. N. Meade, J. G. Miller, R. W. Payne, Thos. Ryan and E. F. Schermerhorn.

Railroad Accessories Corp., New York; power track machines for tightening and loosening nuts and setting screw spikes, bolt tension calibrator; S. G. Ellis, B. A. Lundy, B. A. Lundy, Jr., F. C. Lavarck and J. M. Mercer.

Rails Co., New Haven, Conn.; compression screw spikes, compression spring rail spike, compression-type rail fastenings, full-throated cut spikes, oil, electric and gas snow melters, rail, flange and curve lubricator, crossing flange-way bracket, springtight tie plate assembly; R. E. Bell, L. T. Burwell, G. M. Hogan and J. V. Wescott.

Railway Age—Railway Engineering and Maintenance—Railway Signaling, New York; copies of publications; Geo. E. Boyd, M. H. Dick, J. H. Dunn, L. R. Gurley, S. W. Hickey, N. D. Howard, Elmer T. Howson, P. D. Juraschek, F. C. Koch, Henry Lee, J. G. Little, H. E. McCandless, H. H. Melville, H. A. Morrison, Charles Packard, E. J. Phillips, L. B. Sherman and J. S. Vreeland.

Railway Purchases and Stores, Chicago; copies of publication; J. P. Murphy, Jr., K. F. Sherran and Ed. Wray.

Railway Track-Work Co., Philadelphia, Pa.; grinder, portable stock-rail grinder, rail-joint cross grinder, portable track grinder, samples of abrasives, literature; H. M. Moorhead and A. M. Nardini.

Ramapo Ajax Div. (American Brake & Shoe Foundry Co.), New York; safety switch stands, rigid switch stands, rail lubricator, reversible manganese insert crossing, manganese welding rods, photographs and literature on switches and crossings; T. E. Akers, G. A. Carlson, G. M. Cooper, J. E. Davidson, H. Hazelton, A. F. Hess, D. F. Hilton, J. V. Houston, A. F. Ruber, J. S. Hutchins, J. A. McVicker, E. F. Needham and W. Perdue.

Reade Manufacturing Co., Inc., Jersey City, N. J.; literature on chemical weed killer, dry and liquid form; D. M. DeWitt, G. W. Morrow, C. A. Parish, Charles H. Reade, Charles H. Reade, Jr., C. F. Reade and W. L. Tanner.

Republic Steel Corp., Cleveland, Ohio; track bolts, track spikes, tie plates, guard rail, fencing and barbed wire, steel fence posts, culverts, sectional plate, nails and staples, iron sheets, iron pipe, bolts and nuts, turnbuckles, steel armored concrete highway crossing; R. A. Bell, A. J. Brandt, E. K. Connelly, T. B. Davies, J. R. Fraine, N. W. Halls, B. F. Handloser, W. H. Hanna, W. E. Lambert, A. D. McAdam, H. L. Miller, W. T. O'Neill, A. J. Roof, Frank Schumacher and L. L. Solger.

Sika, Inc., New York; concrete water-proofing material, demonstration of use; O. R. Haggard.

Sperry Products, Inc., Hoboken, N. J.; illustrations showing 11 years of development in detector car improvements, samples of rail defects, illustrations and motion pictures of flash butt welding of rails, with actual specimens of flash welds tested, display board of gyro track recorder for track inspection; E. A. Crawford, J. B. Farwell, C. W. Gennett, Jr., G. V. Jewell and C. W. Loos.

Teleweld, Inc., Chicago; joint shims, samples of welded joints, heat-treated joints, Brinnell-hardness tester; R. E. Bell, T. L. Borman, G. A. Greene, John E. Hogan, C. W. McKee, H. E. McKee, E. J. Payton, J. A. Roche and Stanley H. Smith.

Templeton, Kenly & Co., Ltd., Chicago; rail pullers and expanders, tie spacer, track jacks, push and pull jacks, bridge jacks, ball bearing screw jacks, journal jacks; H. C. Dilsizian, R. B. Hill, W. H. Kreer, P. H. McManus, William Simpson and J. B. Templeton.

Timber Engineering Co., Washington, D. C.; timber connectors and installation tools, split rings, toothed rings, toothed or flanged shear plates, spiked grids and clamping plates for bridge and building construction; J. B. Jordan, L. P. Keith and Ira D. S. Kelly.

United States Steel Corporation, Pittsburgh, Pa.:
American Bridge Company, Ambridge, Pa.
American Steel & Wire Co., Cleveland, Ohio; right-of-way fencing, electrical wires, rail bonds, wire rope; H. R. Barthel, H. H. Febrey, C. W. Mathews, A. J. McKernan and C. L. Tite.

Carnegie-Illinois Steel Company, Pittsburgh, Pa.; complete line of accessories for railway engineering and maintenance; O. H. Baker, Marcus Aurelius, J. J. Davis, Jr., John English, C. B. Friday, Norman Hench, J. C. Dilworth, John A. Reed, H. K. Troxell, Carroll Burton, H. Q. Day, W. H. Friedline, H. H. McDonald, J. A. McHugh, Maxwell Rahner, H. L. Brindle, R. W. Steigerwalt, F. A. Wickerham, S. L. Graham, Harry Stehl, John Hornbrook, L. B. Worthington, W. H. Andrews, J. H. Duff, R. E. Marshall, C. E. McIntyre, P. M. Guba, T. Lane Watson, J. R. Johnston, P. P. Burris, D. L. Merrell, W. H. Towner, R. K. Bowden, F. W. Bendell, E. H. Davidson, C. H. Jackman, L. J. Rohl, T. H. Sanderson, J. G. Sullivan and C. W. Tuttle.

Cyclone Fence Company, North Chicago, Ill.; chain link fence, property protection fence, hair-pin type steel picket fencing.

Scully Steel Products Co., Chicago; complete line of accessories for railway engineering and maintenance; P. A. Blake, C. H. Eib, A. W. Johnson, L. W. Leight, E. Reichenbach, Walter Schuett, L. H. Schwan, E. C. Vallette.

Tennessee Coal, Iron & Railroad Company, Birmingham, Ala.; complete line of accessories for railway engineering and maintenance; G. C. Bruner and J. T. Moore.

U. S. Wind Engine & Pump Co., Batavia, Ill.; water-column, valves, riser pipe frost-proofing, switch stands, float valves, models of water tanks and towers, electric pump jack; H. Beem, R. C. Carlson, J. P. Prindle, A. W. Swanson, LeB. Turner and C. E. Ward.

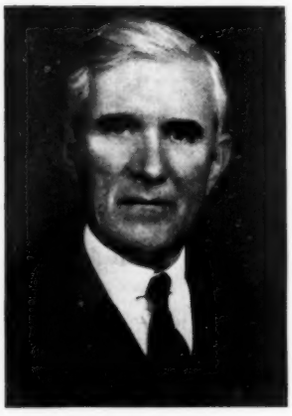
Western Railroad Supply Co., Chicago; flashing crossing signals, gate lamps, reflector signs, electric meters, signal accessories, dragging-equipment detectors, automatic crossing gates; T. H. Cole, F. M. Dolan, L. V. Dolan, Frank Faeth, Godfrey Gort, Norman Gort, John Hensel, John E. Hogan, S. Miskelly, Stanley H. Smith and A. F. Whitehorn.

Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.; track switch heater, lighting unit, rectifier, safety switch demonstration, instrument display, surge-proof transformer, water cooler, lightning arresters, carbon brushes and glass tape; W. G. Brooks, C. B. Bruse, A. H. Candee, S. F. Johnson, R. H. Kilner, T. W. Merrill, C. W. Morgan, L. A. Spangler and T. C. Wurts.

Wilson Welder & Metals Co., Inc., North Bergen, N. J.; Wilson gas-drive electric welder, electrodes and accessories; C. B. Armstrong, J. T. Gillespie, E. Walters and Ira B. Yates.

(Continued on page 496)

Signal Section Meets in Chicago



E. P. Weatherby, T. & P., Chairman

Discussions of costs involved in stopping trains, crossing protection, and economic value of battery-lighted switch lamps feature two-day program

J. S. Gensheimer, Penna., Vice-Chairman

THE forty-fifth annual meeting of the Signal Section, Association of American Railroads, was held at the Hotel Stevens, Chicago, on March 13 and 14. E. P. Weatherby, signal engineer of the Texas & Pacific, and chairman of the section, presided. The attendance totaled 404 members and guests, an increase of 29 over the last year's meeting.

In addition to considering new and revised specifications proposed by various committees, the section discussed several general subjects important to signaling practice. These included progress reports on the cost of stopping trains, protection of traffic against slides and rock falls, standardization of railway signal glasses, train-order signal aspects, heat treatment and welding of rail in track-circuited territory, protection of highway grade crossings, the application of radio for railroad communication, and the economic value of battery-lighted switch lamps.

In his opening address, Chairman Weatherby encouraged the young men in the association to take an active part in the discussion, and explained that more young men should be appointed on the committees. With the speeding up of trains requiring the respacing of signals, and the more extensive installation of centralized traffic control, signal engineers, he said, are becoming more and more involved in train operation problems.

As a part of the program, several addresses were delivered. J. W. King, vice-president of the Association of American Railroads, presented a brief address explaining the negotiations between the A. A. R. Committee on Signaling, and the Bureau of Safety in the preparation of rules concerning the inspection and maintenance of signaling facilities in conformance with the new signal inspection law. Paul Penhune, designer and director of "Railroads at Work" of the New York World's Fair, explained the railroad exhibits to be on display at this fair. P. M. Gault, signal engineer, Missouri Pacific, gave a brief address on methods of signaling in England, based on his observations during a recent trip to that country. W. J. Patterson, Director of the Bureau of Safety, explained the administration of the new Signal Inspection Law, an extended abstract of this address being given herewith.

Address by W. J. Patterson

I am very glad to be here at your invitation to discuss the status of administration of Section 26 of the Interstate Commerce Act as amended August 26, 1937, commonly referred to as the signal inspection law. The Bureau of Safety and the Signal Section are both interested in this law, for the reason that it imposes certain definite duties and responsibilities upon the Interstate Commerce Commission as well as on the railroads which are subject to its provisions. To accomplish the purposes of this legislation it must be reasonably observed and administered, and this can best be brought about by co-operative action in working out the practical problems which are involved.

Under this section of the law, the commission is authorized, if found necessary in the public interest, to require installations of the block signal system, interlocking, automatic train stop, train control and cab signal devices, and other similar appliances, methods and systems intended to promote the safety of railroad operation, and to prescribe specifications and requirements with which such ordered installations must comply. The commission has not yet issued any order under this provision of the amended section.

Changes in Existing Installations

The amendment also provides that block signal systems, interlocking, and automatic train stop, train control and cab signal devices which were in use on the date of enactment of this amendment, and installations subsequently made, may not be discontinued or materially modified by the carriers without approval by the commission. For the purpose of establishing a systematic procedure for filing and acting upon applications for approval of proposed discontinuance and modifications under this provision, a commission circular was issued December 1, 1937, setting forth certain data which should be included in such applications. When such an application is filed, a public notice is issued by the commission, setting forth the location and the nature of the proposed changes; this is for the purpose of giving interested parties an opportunity to so indicate in case they desire to be heard in reference thereto.

Each application is also investigated by our engineers or inspectors, and in some instances conferences are held with inter-

ested persons. In case there is opposition to approval of an application, a public hearing is held, and, thereafter, the matter is determined by the commission or a division thereof; in uncontested cases action is by a commissioner to whom appropriate authority has been delegated by the commission.

As of February 28, 1939, a total number of applications for approval which have been filed under this provision of the law is 953; of these 885 applications were approved, 3 applications were disapproved, 3 applications were cancelled or withdrawn, and 62 applications were under investigation or pending action by the commission. Of the total of 953 applications filed, public hearings were held in 9 cases, and in 2 additional pending cases hearings are now scheduled.

Maintenance and Inspection Rules

Another subject covered by the amended section of the law relates to rules, standards and instructions for the installation, inspection, maintenance and repair of the systems, devices and appliances listed in this section. The carriers were given a period of six months, ending February 26, 1938, within which to file their rules, standards and instructions; and a total of 222 carriers made submissions. The duty then devolved upon the commission to approve the rules, standards, and instructions which were submitted, with such modifications as might be required by the commission. With respect to carriers which did not file rules, standards and instructions in accordance with the law, it became the duty of the commission to prescribe such rules, standards and instructions. Rules, standards and instructions, when either approved or prescribed by the commission, become obligatory upon the carriers. The law also requires the carriers to maintain the specified systems, devices and appliances in safe and proper condition and to make inspections and tests in accordance with the established rules, standards and instructions, and the commission is also authorized to make similar inspections and tests.

This matter of rules, standards and instructions has been given careful and continuous consideration by the Bureau of Safety for more than a year. After the expiration of the six-months period provided by the law, preparation of a tentative code of rules, standards and instructions was begun, based upon the submissions previously made and such additional information as had been secured; this tentative code is designed to establish uniform rules, standards and instructions, as provided for by the law, which will be applicable to all carriers subject to this section of the act.

This tentative code has been subjected to a long process of development and refinement. After being drafted, it was considered at length by the staff of the Bureau of Safety, which includes men who are familiar with signals and signaling practice, as well as with operating conditions and practices. Extended conferences were then held, attended by representatives of the carriers, the organizations of railroad employees and the Bureau of Safety; at these conferences, which covered parts of four months, the tentative code of rules, standards and instructions was considered in detail, and various revisions were made. Compromises between the widely varying points of view were required with respect to a number of the sections of the tentative code, and it became necessary to defer until a later date final consideration of proposed sections relating to manual, controlled manual, and staff block systems and spring switches. With these exceptions, however, the proposed code as revised at the conclusion of the conferences on January 19, 1939, was acceptable to the members in attendance at the conferences.

Subsequently, copies of the code, as revised at these conferences, were furnished to the representatives of the carriers for submission to the member roads and to representatives of employee organizations, as a result of which a few additional suggestions were made and the matter is now being given final consideration before submission to the commission for approval.

Reports of Failures

Another provision of the law requires the carriers to file with the commission reports of failures of the systems, devices and appliances to indicate or function as intended. Under date of November 13, 1937, the commission issued an order prescribing forms and instructions for these failure reports, and these reports have been filed monthly, beginning January, 1938. These failure reports for the period January to June, 1938, inclusive, have been tabulated, and the results published in the annual report of the Bureau of Safety for the fiscal year ended June 30, 1938.

Economics of Signaling

C. A. Taylor, Chairman*

In addition to submitting information on the economic aspects of four automatic interlockings, a remote control interlocking, and an automatic block signal system modernization program, Committee I contributed a discussion on the economic value of battery-lighted switch lamps and an interesting study of the cost of stopping trains.

Previous reports by Committee I on the cost of stopping trains have dealt or treated only with hp. hours of work required at the axle with various types of locomotives to accelerate various tonnages to various speeds on level tangent track. In its report on this subject at the 1939 meeting, the committee endeavored, for the first time, to convert the hp. hours of work wasted in making a train-stop into dollars and cents. On the basic principle that accumulated work or kinetic energy stored in a moving body may be expressed by the formula $KE = \frac{Wv^2}{2g}$, the hp. hours required from the locomotive delivered at the axle to haul and accelerate any weight train to any speed or the maximum speed attainable by any locomotive hauling any weight train may be determined by calculation. Train braking, where time, distance, profile and car resistance are known, may be calculated in terms of hp. hours of work previously produced by the locomotive at the driving axle. Given the characteristics of a locomotive, the B. t. u. value, the unit cost of fuel, and the unit cost of water, the cost of power dissipated in making a stop from normal running speed and the cost of power required to regain normal running speed may be determined as against the power required to run through at normal speed without stop, and, by subtraction, the cost of making the stop may be determined. The necessary calculations were made and charts prepared for various weight trains hauled by four different types of locomotives. The costs, obtained from the use of the charts and formulae suggested by Committee I, represent only fuel and water costs, and do not include costs involving damage to equipment, brake shoe wear, overtime wages, etc. A typical example of the use of the charts and formulae indicated that $2.374 was the cost of fuel and water wasted making a stop with a 6,450-ton gross weight train of 80-ton cars on level tangent track, hauled by a 2-10-4 locomotive with a "steam factor" of 18, a grate area of 121 sq. ft., fuel at $3.21 per ton on tender, and water at 12 cents per 1,000 gal.

In determining the economic value of battery-lighted switch lamps, the committee found that "the cost of installation varies greatly, depending upon several factors, such as the type and size of battery housing provided; the number of cells of battery provided for series or series-multiple service; whether line circuits have to be provided for approach lighting; the kind of wire used (armored or otherwise); etc. The highest installation cost reported is $75 per lamp approach-lighted, and the lowest, $15.89 continuous burning; the average is $34.87. The maintenance and operating cost of electric lighting varies from $16.22 per lamp per year to $5, with an average of $11.85. The maintenance and operating costs of oil lighting were reported as ranging from $23.33 to $15, this depending greatly upon the grouping or distribution of the lamps and upon the use of large or small oil fonts, affecting the labor costs. The average is $18.79.

Discussion

C. A. Taylor, committee chairman, stated that the report on the cost of stopping trains represented initial work in an attempt to ascertain a general figure which might be used with a fair degree of accuracy, and that work on this subject would be continued. The report was read by W. S. Storms, (Erie). R. B. Elsworth, (N. Y. C.), suggested the intangible costs which cannot be measured be listed in a note. Mr. Storms stated that the committee would list the principal items of this nature, such as brake-shoe wear, and wear and tear on equipment. J. P. Muller, (B. & M.), presented the report on the economic value of battery-lighted switch lamps.

* Superintendent Telegraph & Signals, Chesapeake & Ohio.

Report on Highway Crossing Protection

P. M. Gault, Chairman*

The report of the Committee on Highway Grade Crossing Protection featured a discussion of developments in types of protection, proposed requisites for automatic highway crossing gates and a discussion of methods available for minimizing or eliminating phantom indications in flashing-light signals; the committee also submitted a drawing covering a complete 50-deg. reflector-type crossing sign.

The requisites proposed for automatic gate installations were as follows:

"1. Automatic gates, where installed, shall be provided as an adjunct to A. A. R. recommended automatic crossing signals of the flashing-light or wig-wag type.

"2. Automatic gates for the protection of highway traffic at a railroad grade crossing shall, when indicating the approach of a train, present toward the highway the appearance of a horizontal arm extending over the traveled roadway a sufficient distance to cover the lane or lanes used by traffic approaching the crossing.

"3. The automatic gate arms, when not indicating the approach of a train, shall not obstruct or interfere with highway traffic.

"4. A highway crossing bell, if used, shall sound a warning while the gate is being lowered.

"5. The automatic gate arms shall be mounted on posts or housings containing the arm operating mechanisms.

"6. The design of the gate operating mechanism shall, so far as practicable, be such as to insure proper operation during unfavorable weather conditions, and if out of order, the gate arms shall assume the horizontal position across the roadway.

"7. The mechanism shall be so designed that if the arms, while being raised or lowered, strike or foul an object, they will readily stop, and, on removal of the obstruction, shall assume the position corresponding with the control apparatus.

"8. Circuits for operation of the automatic gates shall be so arranged that gates will start to assume the horizontal position between 3 and 5 seconds after the warning signals start to operate. Gates shall reach full horizontal position before the arrival of the fastest train operated over the crossing and shall remain down until the rear of the train has cleared the crossing.

"9. Each gate arm, extending over the roadway, shall have two red lights for each lane of traffic it protects, shining in both directions along the highway for night indication.

"10. The bottom of the gate arms, when in the horizontal position, shall be not less than 3, nor more than 4 ft. above the crown of the roadway.

"11. The gate arms shall be painted on both sides with alternate diagonal stripes of white and black.

"12. The automatic highway crossing signals shall operate in accordance with A. A. R. recommended practice and independently of the gates.

"13. Details of the signals, gates, operating mechanisms, and control circuits shall be in accordance with A. A. R. recommended practice.

"14. The gate arms shall operate uniformly, smoothly, and complete all movements without rebound or slap, and be securely held when in the raised position.

"15. Each individual gate post shall be provided with independent operating mechanism, and housing to be of sufficient size to allow ready inspection, adjustment and repairs.

"16. The lights on the gate arms shall burn continuously except when arms are in the raised position.

"17. The highway traffic lanes in the vicinity of the crossing shall be marked distinctly."

Discussion

When presenting the requisites for automatic gate installations, Chairman Gault stated that the committee had received several letters and suggestions concerning items 9 and 16. C. A. Taylor, (C. & O.), expressed an opinion that the Signal Section should not approve practice which did not conform with the regulations of several states, i. e., that the states require three lamps on each gate arm and that two of the lamps are to be flashed as contrasted with steady burning.

E. W. Reich, (Read.), argued in favor of the requisites as presented, stating that a flashing-light crossing signal is recognized as a stop-and-go signal, whereas an obstruction across a highway is an obstacle. If the gate lamps are flashed, this aspect would not be consistent with the aspect intended to be conveyed. Lamps on manually-operated gates are burned steadily, and to be consistent all gate lamps should be steady burning, and the flashing lights should be in the signal only. He agreed that there was some merit to the use of a third lamp near the tip of the arm, located approximately over the stripe on the pavement marking the division of the lanes of traffic. E. G. Stradling, (C. I. & L.), agreed with Mr. Reich, that the gate lamps should burn steadily. H. C. Sampson, (Alton), stated that a flashing light attracts attention and is, therefore, more effective than a steady burning lamp. In view of the fact that equipment is available at each installation to flash the lamps without extra cost, he said that he was in favor of flashing two of the gate lamps and burning the one on the end steadily. Mr. Gault explained that the committee had received a letter from Godfrey Gort, president of the Western Railroad Supply Company, concerning item 9 and 16, and he requested S. E. Gillespie, vice-president of the W. R. R. S. Co., to read the letter, a transcript of which follows:

"Dear Sir:

"We are heartily in accord with the requisites for automatic gates, to be submitted for action to the March convention, with the exception of paragraphs 9 and 16.

"Several criticisms have been made of the use of an even number of gate arm lights, and of steady burning gate arm lights. Our experience in connection with automatic gate installations has been quite extensive in the past two years, and we feel that we have had contact with a sufficient number of persons among the railroad men and state and federal officials to state that, in our opinion, requisites 9 and 16 are not in accordance with the views of the majority of them. Several reasons have been mentioned by various people which we desire to call to your attention for whatever consideration you may wish to give them:

"Requisite No. 9 would entail placing the lights within the boundaries of the marked traffic lane or lanes, where, if they burned steadily, as required by paragraph 16, they might easily be mistaken for the twin tail lights, or twin stop lights of an automobile or automobiles in the traffic lane or lanes. Such a mistaken assumption on the part of the driver of an automobile approaching a crossing at night time with the gates lowered, and his vision of the wayside flashers obscured by another vehicle traveling ahead of him, might easily cause the driver to crash into the side of a train passing over or standing on the crossing. He would be inclined to pass to the left of the two lights, and he would be unable to see the lights on the far side of the crossing, or any other obstruction to his free passage on the left side of the street or highway. With an odd number of lights on each gate arm on a two lane highway, there would be one near the tip of the arm which would be on or near the center line of the highway, where it would be much less liable to be obscured by a standing vehicle, and if three lights are used, as has been standard practice on more than 200 gates installed in the past 18 months, the three would be so spaced that a vehicle could not obscure all three of them. Further, if three lights are used, and the two are made to flash, there is little likelihood of them being mistaken for lights on the rear of another vehicle.

"On a four-lane highway, the three lights commonly used are also effective, since they are not easily mistaken for vehicle lights, and because they can be located one at the center line of the highway, one over the line dividing the two approach lanes, and one near the curb so that even two standing vehicles near the gate cannot obscure all three lights from the view of approaching, following vehicles.

"The facts that most modern cars are equipped with two tail and stop lights, and that the lights on many makes of cars are now approximately 3 to 4 ft. above the pavement, should not be overlooked when considering the location of two lights in each traffic lane, as proposed in the requisites.

"It should also be borne in mind that the alternate flashing of two of the three lights reduces the energy consumption to that of two steady-burning lights, whereas in the case of four-lane or wider highways, the requisites would necessitate four steady-burning lights per gate, or twice the number required by the three-light system with two lights flashing that has been used on

* Signal Engineer, Missouri Pacific.

the more than 200 gates installed in the recent past, and as is specified on an additional 70 or more gates to be installed in the next few months in one state alone.

"For your information, we would advise that a number of states have adopted requisites or specifications covering automatic gates, and without exception these requisites conform almost exactly to the proposed A. A. R., Signal Section requisites, except for requisites 9 and 16. All state requisites combine in one paragraph the matter of gate arm lights, and their requisites on this subject read, in every case, about as follows:

" 'Each gate arm extending over the roadway shall have three red lights, shining in both directions along the highway, so positioned as to insure, so far as possible, that no vehicle or vehicles standing within the limits of the traffic lane or lanes approaching the crossing can obscure all three lights from the view of drivers of following vehicles. The light nearest the tip of each arm shall burn steadily and the other two lights on each arm shall flash alternately in unison with the flashing lights of the roadside signal.' "

Mr. Taylor and Mr. Stradling suggested that the matter of gate lamps be put to a standing vote. On the question whether two or three gate lamps should be used, a large number of the members voted in favor of three lamps and none voted for two lamps. Twenty-two members voted in favor of burning all three lamps steadily, while 56 voted in favor of flashing two lamps and burning the one on the tip end of the arm steadily. Chairman Gault stated that the committee would rewrite items 9 and 16 to conform with the vote on the above question, and with these revisions the requisites were adopted.

J. H. Oppelt, (N. Y. C. & St. L.), objected to the requirement of a pipe post, cast-iron base and concrete foundations for mounting the standard reflectorized crossbuck sign. He stated that a post made of a section of discarded rail was satisfactory and much cheaper. If the standard proposed is adopted, some state commission might require the roads to follow the A. A. R. standard. R. E. Green, (M. C.), and others agreed with Mr. Oppelt, and suggested an alternate requisite permitting a choice of type of post to be used. The suggestion, however, was not accepted by the committee and the standard design was approved by vote.

Following, but not a part of the report of this committee, Mr. Gault explained that a special committee, including B. J. Schwendt, N. Y. C.; C. A. Taylor, C. & O.; and Mr. Gault, had been appointed to prepare a resolution which he read, and which later was approved by the Section for presentation to the officers of the Association of American Railroads for such action as they care to take. The resolution in brief was to the effect that the present practice of each of the separate states having jurisdiction over the preparation of plans and the purchasing of materials for automatic highway crossing protection paid for by Federal funds was inefficient, and that the construction work should, in the interests of safety, be handled by railroad signal department forces. Whereas a period of from 6 months to 12 months or more may elapse from the time money is appropriated by the Federal government until the state commissions can handle negotiations and get installations completed, the railroads could handle such projects, from authorization to completion, in 90 days. In consideration of these and other facts, the Signal Section, in the interest of safety, efficiency and economy, recommended that the process be simplified to the following:

1. That the maintaining railroad be requested by the state to furnish the material and make the installation after the railroad representatives have agreed with the state authorities as to the desired arrangement and the estimated cost for each project.

2. That the railroad making the installation shall present bills promptly to the state covering labor and material furnished, such bills to be in accordance with the contract entered into with the state, covering the particular installation, and to be paid by the state within 30 days after receipt.

Signaling Practice

H. G. Morgan, Chairman*

Committee X—Signaling Practice, presented a table showing the extent to which approach signals are being used with train-order signals, stating: "Most railroads require the use of train-order signals in connection with their train-order offices, and most of them provide no approach signals for their train-order signals. Some have caused the restrictive indication of the train-order signal to prevent the next automatic or interlocking signal in the rear from displaying a proceed indication, thereby causing the train to reduce its speed before coming to the train-order signal. The committee has no information that any railroad has employed other than standard automatic or interlocking signal aspects in providing approach indications for train-order signals except experimentally." The committee stated that its reports on proper aspects and indications for four-block signal systems would be held in abeyance until the revised standard code had been distributed to member roads.

Discussion

H. G. Morgan, committee chairman, introduced F. H. Bagley, (S. A. L.), who explained the reasons for the committee's recommendations that the assignment for the preparation of requisites for centralized switch-tender control be withdrawn. Mr. Bagley stated that he had prepared a set of requisites with alternates and had circulated them to several signal engineers for comments and suggestions; when the suggested corrections received had been taken care of, the requisites for centralized switch-tender control were practically identical with the requisites for any modern interlocking; it was for this reason that the committee suggested that the assignment be withdrawn.

Mr. Morgan explained that the committee had postponed its report and recommendations regarding proper aspects for train-order signals used in conjunction with automatic and interlocking signals and its report on aspects and indications for four-block signal systems until after the revised Standard Code of the A. A. R. had been distributed to member roads. Mr. Morgan then introduced C. A. Tillett, signal engineer, Central region, Canadian National, who discussed the report on approach indications for train-order signals. Mr. Tillett stated that the question was first raised in an editorial which appeared in *Railway Signaling;* at the request of the officers of the Canadian National, Mr. Tillett sent a questionnaire to several roads, requesting information on the practice in effect on each road. This information was summarized, placed in tabular form, and presented to Committee X, and was printed in the advance notice of the meeting.

Interlocking

E. T. Ambach, Chairman*

Committee II—Interlocking, submitted for submission to letter ballot two revised specifications, one covering electro-pneumatic switch-operating mechanisms and the other covering wiring; it also proposed a revised set of requisites for mechanically locking the levers of interlocking machines.

The committee also submitted a report on practices for the protection of traffic against slides and rock falls, which included five diagrams of typical safety fences which may be used for this purpose. Slide fence data accompanying the report indicate that the average cost per lineal foot varies from 90 cents to $3. In discussing this problem, the committee made the following comment: "The problem of protecting against falling rocks or rock fragments which might lodge on the track is a serious and expensive one. Earth slides give some concern, but the greatest problem is with rock, or shale and limestone, which is subject to weathering and readily fractured by uneven expansion or contraction by freezing or thawing weather. Detector fences are used on a number of railroads for protection against derailment due to falling rocks, trees, earth slides, and other foreign material obstructing track. Their use provides continuous protection, whereas it is impracticable to employ a sufficient number of watchmen to provide effective patrol over entire slide areas and have the men in position to stop trains in the event of hazard. The detector device sometimes sets the automatic signals at stop when rocks, which would not obstruct the track, encounter the fence, delaying trains unnecessarily until the device is reset. One railroad, to avoid unnecessary delay to trains due to signals set at stop by small rocks rolling down and striking the fence, has installed a second wire fence which is rigidly attached on

* Signal Engineer, Illinois Central.

* Assistant Signal Engineer, Baltimore & Ohio.

the bluff side of the fence to intercept the small rocks. On some railroads special markers are used on automatic signals as information to enginemen that signals are also controlled by slide detector devices and track may be obstructed by a slide."

Other Committee Reports

The Committee on Automatic Train Control and Signals presented information regarding recent activities in the use of radio communication for railroad purposes, describing several test installations of front-to-rear-end radio on freight trains, and discussing frequency ranges available for such use.

New specifications, covering flasher relays, tractive armature d-c. neutral interlocking relays, and centralized traffic control type neutral relays, were submitted for acceptance by letter ballot by Committee IV—Automatic Block Signaling. Requisites also were submitted for track welding or heat treating in track circuit territory, for a-c. and d-c. coded signal systems, and for protection of oil sidings. Two additional reports, covering Section E—Shielding, and Section G—Transportation, on the development of proposed inductive co-ordination measures, will be presented at the 1939 annual meeting of the Telephone and Telegraph Section, in St. Louis, Mo., on April 18, 19 and 20.

The Committee on Contracts and Instructions submitted a set of instructions for the adjustment of electric lever locks and mechanical locking to insure operating margin, a report that work on Chapter IV—Centralized Traffic Control, American Railway Signaling Principles and Practices, is expected to be completed in 1939, and a discussion of various circuit designs which can be used to reduce the number of line wires.

The Committee on Designs recommended acceptance of five revised drawings, covering terminal connectors, foundations for ground mast signals, concrete battery boxes, bases for 4-in. masts, and hand lantern globes, and recommended that four drawings be removed from the Manual. The committee submitted five new drawings covering multiple-unit terminal blocks, 250-a. h. primary battery jars, 50-deg. reflector crossing sign details and assembly on pre-cast foundations for 4-in. masts. Revised specifications were proposed, also, for grey iron castings and for refined iron bars, while a new specification was submitted for multiple-unit terminal blocks. In order to simplify and standardize electric lamps used for signal purposes, a tabulation showing 193 types of lamps and the extent of their use was prepared by the committee with the cooperation of lamp and signal manufacturers and 27 representative railroads, the lamps being classified in the order of their activity; the committee recommended that railroads carrying inactive lamps make an effort to replace them before the tabulation is again presented. The committee also presented Reports 6 and 7 of the National Bureau of Standards in connection with Specification 69-38 and 69-35 covering signal glasses.

The Committee on Materials Research proposed revisions of six specifications, submitted two new specifications, and recommended changes required to harmonize sections covering binding posts in specifications. The revised specifications covered types "A" and "B" copper-oxide caustic soda primary cells, lead-acid stationary storage batteries, and No. 6 dry cells. The two new specifications were for paint and painting of braid-covered aerial wires and cables.

Four tables giving sags to be allowed in stringing new line wires were contributed by the Committee on Overhead and Underground Lines. The committee also proposed revised specifications covering enameled round copper magnet wire, galvanized copper-bearing steel line wire, and steel guy and messenger strand. In addition, the committee discussed the possible substitution of asbestos, varnished cambric or other types of non-inflammable materials as insulation for wire for use in signal stations.

Signal Appliance Association

At the Signal Appliance Association's annual meeting, held at the Stevens Hotel, March 14, the following officers and members of the executive committee were elected: Chairman, H. S. C. Folk, Electric Storage Battery Co.; vice-chairman, G. Swallow, Continental-Diamond Fibre Co.; secy.-treas., G. A. Nelson, Waterbury Battery Co. Executive committee: H. H. Febrey, American Steel & Wire Co.; C. Gilman, Massey Concrete Products Co.; D. H. Green, National Carbon Co.; H. M. Jacobs, General Electric Co.; R. D. John, Adams & Westlake Co.; B. A. Lundy, Railroad Accessories Corp.; E. F. Schermerhorn, Rail Joint Co.; R. H. Weber, Thos. A. Edison, Inc.; and (honorary) W. P. Allen, Union Switch & Signal Co.; S. G. Johnson, General Railway Signal Co.; F. C. Koch, Simmons-Boardman Publishing Corp.; J. D. Underhill, The Okonite Co.; and J. Warren Young, Kerite Insulated Wire & Cable Co.

N. R. A. A. Presents Effective Exhibit at Chicago

(*Continued from page 491*)

Woolery Machine Co., Minneapolis, Minn.; display of weed burner photographs, power tie cutting machine, drawing of a switch-thawing machine; Barry Collns, A. J. Franke, A. C. Heath and H. E. Woolery.

Associate Members

Adams & Westlake Company, Chicago.
American Chain & Cable Company, Bridgeport, Conn.
American Hoist & Derrick Company, Minneapolis, Minn.
American Nut & Bolt Fastener Co., Pittsburgh, Pa.
Austin-Western Road Machinery Co., Aurora, Ill.
Bethlehem Steel Company, Bethlehem, Pa.
Chicago Pneumatic Tool Company, New York.
Clay Products Association, Chicago.
Dimick-Mosher Products Company, Boston, Mass.
Eagle Grinding Wheel Co., Chicago.
Frog Switch & Mfg. Company, Carlisle, Pa.
General Electric Company, Schenectady, N. Y.
General Railway Signal Company, Rochester, N. Y.
Ingersoll-Rand Company, New York.
Inland Steel Company, Chicago.
Jones & Laughlin Steel Corporation, Pittsburgh, Pa.
Joyce-Cridland Company, Dayton, Ohio.
Kerite Insulated Wire & Cable Co., Inc., Chicago.
Lufkin Rule Co., Saginaw, Mich.
Lundie Engineering Corporation, New York.
Massey Concrete Products Corporation, Chicago.
National Carbon Company, Inc., New York.
Okonite Company, Passaic, N. J.
Positive Lock Washer Co., Newark, N. J.
Positive Rail Anchor Co., Chicago.
Pyle-National Company, Chicago.
Q and C Company, New York.
Railway Maintenance Corporation, Pittsburgh, Pa.
T. W. Snow Construction Company, Chicago.
Taylor-Wharton Iron & Steel Co., Chicago.
Union Switch & Signal Co., Swissvale, Pa.
United States Gypsum Company, Chicago.
Warren Tool Corporation, Warren, Ohio.
Woodings-Verona Tool Works, Verona, Pa.
Yale & Towne Mfg. Co., Philadelphia, Pa.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

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Photo by W. R. McGee

Train of 90 Cars on the Northern Pacific Running One Mile West of Livingston, Mont.

NEWS

War Would Bring Transport Crisis

Col. Young says '29 traffic would mean equipment shortage — Trucks little help

A warning that if a national emergency should give rise to railroad tonnage equal to or greater than the traffic volume of 1929, "we might suffer congestion of major proportions," was sounded by Colonel C. D. Young, vice-president (real estate, purchases and insurance), Pennsylvania, at a luncheon address before the Ohio Valley Advisory Board in Columbus, Ohio, March 14.

The speaker, who was commissioned a lieutenant-colonel of engineers during the war while engaged in overseas railroad operations, and is now chief of railway section, office of chief of engineers, U. S. Army, with rank of colonel, pointed out that the carriers today own only 75 per cent as many locomotives and freight cars as they did in 1929. Even taking into account increased average tractive power and increased capacity and performance, he believes that "if the railroads were suddenly faced today with a business equal to that of 1929, we might suffer congestion of major importance." It was Col. Young's opinion that if the recommendations of the Committee-of-Six were heeded, the carriers will be prepared for any emergency of war.

He then went on to point out the necessity of adequate railroad movement in mobilization and defense, quoting such authorities as Samuel Rea, former Pennsylvania president, and W. G. McAdoo, federal administrator of railroads during the war, both of whom testified as to the inability of the carriers in 1917 to carry the load which as the latter wrote, "was so close to the limit of endurance that they were always on the very edge of a general breakdown in service." Highways, he reminded his audience, are inadequate for mass movement, and because of the predominance of small vehicles, would waste needed man-power for transportation in emergency periods.

Col. Young expressed the fear that a repetition of the experiences of the last war might occur. Said he: "The ability of the railroads to measure up to the extraordinary demands that would be imposed on them if war came is apparently taken for granted by the public and little consideration is given to them in discussions of national defense. This is complimentary to railroad management and workers, but its wisdom is doubted." Reviewing the situation, he observed that "heroic measures" would be necessary to put the carriers in shape financially to carry on, and supported the legislation proposed by the Committee-of-Six as best meeting the railroads' needs.

I. C. C. Reopens Divisions Case

The Interstate Commerce Commission has granted the petition of the Chicago Great Western trustees for a reopening of the No. 15234 proceeding which was concerned with divisions in Western and Mountain-Pacific territories. The C. G. W. trustees—Patrick H. Joyce and Luther M. Walter—filed this petition during the latter part of last August as noted in the *Railway Age* of September 3, 1938, page 357. As noted elsewhere in this issue, the case was referred to by Mr. Joyce in his testimony at the March 14 session of House committee on interstate and foreign commerce hearings on Chairman Lea's omnibus transport bill.

Chicago Traffic Club to Have "Perfect Shipping" Luncheon

A luncheon to launch a campaign against transportation waste will be held by the Traffic Club of Chicago on March 21. The luncheon, in support of the "Perfect Shipping and Handling Month" to be conducted by the regional advisory boards in April, will have as its speakers John W. Kieckhefer, president of the Kieckhefer Container Corporation; W. J. Williamson, general traffic manager of Sears Roebuck & Co., and Robert S. Henry, assistant to the president of the Association of American Railroads.

Railroads Lose in Jersey Tax Rate Case

The United States Supreme Court, at its March 13 session, in the case of the Lehigh Valley and other New Jersey carriers versus Martin and others, denied petitions for writs of certiorari to the United States Circuit Court of Appeals for the third circuit seeking to review a decree of that court which denied suits for injunction against the collection of taxes assessed for 1932 and 1933 under the New Jersey Railroad Tax Act on railroad properties in New Jersey, valued primarily on the basis of the physical value of tangible assets in the State.

M. S. Sloan Raps Rate Structure

Katy head says rate system is out-of-date and outlines three major faults

That the railroads' pricing system is "grotesquely out-of-date and inadequate" was the contention of Matthew S. Sloan, president of the Missouri-Kansas-Texas, speaking last week before a joint meeting of the Trans-Missouri-Kansas Shippers' Advisory Board and the St. Louis Traffic Club.

"We all know," he continued, "how the railroad pricing system originated, grew up and crystallized in its present form. The chief faults of the rate structure are:

"Its lack of flexibility, due to rigidity of the rate-regulatory process in the matter of effecting changes.

"Its lack of adaptability to competitive conditions in the matter of variety in price-terms and its exclusion of the principle of wholesaling.

"Its overemphasis of the so-called 'reasonableness' of charges as distinguished from their non-discriminatory quality.

"It would be near the truth to say that no rail rate that actually moves traffic today could be unreasonable, for there is comparatively little traffic moving in the country today that is not subject, either directly or indirectly, to competitive influences.

"The rate structure should be opened to include almost any kind of rate—trainload, flat carload, agreed rates, etc.—that is in use anywhere in the world. In addition, the rail carriers should be encouraged to experiment freely in this direction, subject only to the exclusion of discrimination, prejudice, preference and rebating.

"On the business-getting side, it appears to me that the railroads have not done as well as they might have done. They have been slow in recognizing the scope and seriousness of the new competition. They have been slower in devising effective ways of meeting it. Granted that they have been seriously handicapped by a degree of regulation and even control not imposed upon other transportation agencies, they have still left undone some things that they might have done.

"They have been reluctant to recognize the full importance of the price element in selling their service, and to meet their new competitors on that basis. There has been need of and there still is need of more aggressive selling effort.

(*Continued on page 503*)

1938 Capital Outlay Was $226,937,000

Expenditures for equipment and improvements less than half 1937 total

Capital expenditures for equipment and other improvements to railway property made by the Class I railroads in 1938 totaled $226,937,000, the Association of American Railroads announced on March 16. This was a decrease of $282,856,000 below such expenditures in 1937, and a decrease of $72,054,000 compared with those in 1936. It also was a decrease of $645,671,000 compared with 1930.

The decrease in capital expenditures in 1938 compared with the preceding year resulted not only from a falling off in purchases of locomotives, freight and passenger cars, and other equipment, but also to a decline in expenditures for heavier rail, additional ballast and other improvements to roadway and structures.

Of the total capital expenditures made in 1938, $115,408,000 was for locomotives, freight and passenger train cars, and other equipment and $111,529,000 was for roadway and structures. Capital expenditures in 1938 for equipment were a decrease of $207,469,000 compared with such expenditures in 1937, and a decrease of $43,696,000 compared with 1936. For roadway and structures, capital expenditures in 1938 were a decrease of $75,387,000 compared with 1937 and a decrease of $28,358,000 compared with 1936.

Expenditures for locomotives in 1938 totaled $39,570,000, compared with $59,738,000 in the preceding year. For freight train cars, $52,814,000 were expended, compared with $212,902,000 in 1937, while for passenger train cars, $18,149,000 were expended, compared with $41,491,000 in the previous year. For other equipment, the railroads in 1938 expended $4,875,000 which was about half of the amount spent for such purposes in 1937.

Among the capital expenditures for roadway and structures made in 1938 was $17,247,000 for heavier rail, compared with $29,149,000 in the preceding year. The railroads also spent $18,231,000 for bridges, trestles and culverts in 1938, which was approximately $1,300,000 less than was spent in the preceding year, and $7,569,000 for yards and sidings, one-half as much as was spent the year before. Expenditures made in the past year for additional ballast, shops and engine houses, station and office buildings, signals, and for other improvements were in each instance less than in 1937. Capital expenditures made annually by the Class I railroads in the past ten years follow:

1938	$226,937,000
1937	509,793,000
1936	298,991,000
1935	188,302,000
1934	212,712,000
1933	103,947,000
1932	167,194,000
1931	361,912,000
1930	872,608,000
1929	853,721,000

Carriers Have $283,820,066 of Deferred Maintenance

Steam railway officials have reported to the Interstate Commerce Commission that at the close of 1938 there was deferred maintenance on their railway properties amounting to $283,820,066, assuming a traffic as large as that of 1937 to be in prospect. This information was given to the Commission by the carriers in response to a questionnaire issued by it on December 12, 1938. The report further indicates that $495,757,106 should be expended during the three-year period, 1939-1941; that is, $165,252,369 annually, for additions, betterments, and extensions to enable the carriers to handle traffic more cheaply or expeditiously. It is explained that these amounts aggregating $779,577,172 are in addition to normal maintenance and do not have any reference to any sums which may be needed to meet maturing obligations incurred in the past.

In view of the fact that the report was issued just as we go to press, a complete and detailed analysis will be given in next week's issue.

B. & O. to Run Inspection Tour of Potomac Yards

The Baltimore & Ohio will operate a public inspection tour out of New York to Potomac Yards and Ivy City round house, Washington, D. C., on Sunday, March 26. The fare of $4.40 for the round trip includes transfer by bus from Union station, Washington, D. C., to the yards and roundhouse.

Rock Island Authorized to Acquire Motor Subsidiary

The trustees of the Chicago, Rock Island & Pacific will be authorized to acquire from the Rock Island Improvement Company control of the Rock Island Motor Transit Company, by purchase of a majority of the capital stock of the latter, if no objection is filed with the Interstate Commerce Commission within the next 20 days, according to a decision of Division 5.

N. Y. Railroad Club to Hold "Electrical Night" March 24

The New York Railroad Club will hold its next meeting Friday, March 24, in the Engineering Societies building, 33 West 39th street, New York. The program will include a lecture on the "Steam-Electric Locomotive" by H. L. Andrews, vice-president, General Electric Company. This will be supplemented by colored lantern slides and motion pictures. The front cover illustration on the four-page announcement distributed in connection with the program is a reproduction of a painting by W. L. Greene, staff artist of General Electric, showing the new Union Pacific 5,000-hp., steam electric locomotive built by the company in co-operation with the Union Pacific. This locomotive was described in the *Railway Age* of December 24, 1938, page 916.

Shipping Study Sent to Congress

Maritime Commission believes domestic shipping problems deserve wider attention

The United States Maritime Commission has transmitted to Congress a detailed study of the domestic shipping industry in which it concludes that our domestic shipping is confronted with a variety of complex problems and that they deserve "wider attention and better understanding on the part of the American public." Part IV of the commission's study concerns itself with the relationship of the railroads and other forms of land transportation to the intercoastal water transportation picture.

This section of the report begins by saying that coastwise steamship lines serving the Atlantic and Gulf seaboards are important to the rail transportation system. A map, the report continues, clearly shows that navigation between points along the Atlantic coast and the Gulf coast in many instances is as direct as transportation by land. The report goes on to point out that the supplementary aspects of this rail-water relationship are sometimes overlooked and concludes that to reach inland from these port cities, whether to tap sources of supply or to serve markets, transportation connections with water lines are necessary.

The report says that joint rail-water rates are common in the coastwise trade, but unknown to the intercoastal with the exception of the Gulf-Pacific service. Water competition on the Atlantic and Gulf coasts, in the opinion of the commission, has been an important factor in the construction of railroad freight rates, and the conclusion is reached that all-rail rates are lower than they probably would be were water competition non-existent.

Turning to the subject of fourth section relief, the commission has examined 28 recent and "pertinent" Interstate Commerce Commission decisions involving fourth section relief in which the I. C. C. granted the relief requested in whole or in part in 25, and denied it in three.

"The granting of fourth section relief," continues the report, "has enabled the railroads to capture certain items of traffic moving in Atlantic and Gulf coastwise trade. This was recently illustrated when the rails sought to obtain a larger share of the citrus fruit traffic from Florida to the north. Immediately after publication of the reduced rail rates, heavy diversions of this traffic from steamship lines occurred and coastwise operators protested that the Interstate Commerce Commission had put them in a "strait-jacket" as far as competition was concerned."

"The Interstate Commerce Commission has been liberal to the railroads in granting fourth section relief in this area, though it has indirectly benefited water lines in cases where it has prescribed joint rail-water rates. Such joint arrangements can benefit both agencies, but the water carriers complain that in many in-

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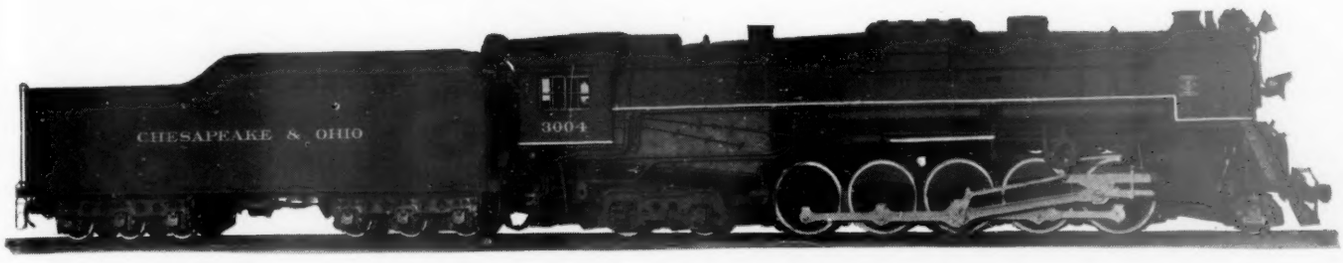
LIMA POWER AT WORK



NEW EQUIPMENT CUTS COSTS

"Because of the introduction of new methods and the perfection of new types of equipment, railroad quarters confidently state that expenses of the carriers probably never again will be as large in relation to gross revenues as in the past .....More efficient fuel consuming power has tended to reduce expense.

Reprinted From Wall Street Journal
March 2, 1939

On a score of railroads Lima-built modern power is proving the money-making abilities of new locomotives.** Higher speeds and heavier train loads result in greater net earnings. Only modern steam locomotives have the required horsepower capacity to provide both these essentials with any flexibility.**

LIMA LOCOMOTIVE WORKS, LIMA LOCOMOTIVE WORKS INCORPORATED INCORPORATED, LIMA, OHIO

stances their share of the joint rate is disproportionately small."

On the Pacific Coast the commission points out that rail rates have been reduced to meet truck competition. This, it says, has been reflected in corresponding reductions in the steamship rates, thus further tending to decrease the latter's revenue. It is also contended that the situation of the water carriers is further threatened by proposals of the rail lines to establish bulk rates on lumber and lumber products from Oregon and Washington points to points in California on a per thousand ft. basis in lieu of the long established weight basis.

The commission goes on to say that "Pacific coast interests protest that this is wrong in principle; discriminatory and detrimental to sawmills located at tidewater and lacking adequate rail facilities and that it will disrupt water rate stabilization not only in lumber but in general cargo. Certain provisions of fourth section relief decisions by the Interstate Commerce Commission have resulted in diversion on the Pacific Coast of considerable portions of port to port water traffic to competing rail lines. This diversion has been claimed as a contributing factor in the failure of at least two steamship lines in that area."

The commission reaches the conclusion that if newer, faster and more efficient vessels are to be built for replacements in the domestic trade the government will have to aid in their construction. It also concludes that "opposition from certain rail lines has retarded establishment of desirable rail-water rates and has prevented water carriers from obtaining traffic to which they are justly entitled. Shippers and receivers of freight are now being deprived of their right to obtain the benefits of the most economical means of transportation."

New England Railroad Club Elects

The following have been elected officers of the New England Railroad Club for 1939-40: President, C. A. Mitchell, office assistant to vice-president, New York, New Haven & Hartford, New Haven, Conn.; Vice-President, E. G. Ringberg, superintendent of shops, Boston & Maine, Concord, N. H.; Treasurer, C. H. Sherburne, Boston, Mass.; Secretary, William E. Cade, Jr., Boston.

Safety Talk by Radio to Schools

A talk on juvenile trespassing and crossing accidents was carried by radio into classrooms in schools in Albuquerque, N. M., on February 13, and in El Paso, Tex., on February 14. Local agents of the Atchison, Topeka & Santa Fe in both cases made arrangements with school authorities to have radios in the classrooms. L. H. Collett, supervisor of safety of the Santa Fe Coast Lines, delivered the address over station KOB at Albuquerque on both days. On the second day station KTSL at El Paso rebroadcast the talk.

Status of Stockyard Companies

The Interstate Commerce Commission has transferred from Omaha, Nebr., to Kansas City, Mo., the March 20 hearing in the Ex Parte 127 investigation of the status of public stockyard companies. Commissioner Splawn will conduct the hearings with the assistance of Examiners Carter and Haden. The program for the Kansas City hearing is the same as that outlined originally for Omaha, as noted in the *Railway Age* of February 25, while the April 17 session at Washington, D. C., will proceed as originally assigned.

House Passes Reorganization Bill

The House, on March 8, passed H. R. 4425, the bill providing for the reorganization of various agencies of the government. Before final passage the House adopted an amendment by Representative Crosser, Democrat of Ohio, which exempts the National Mediation Board, the National Railroad Adjustment Board and the Railroad Retirement Board from the provisions of the bill. The Interstate Commerce Commission was exempted when the bill was introduced and this feature was not changed.

Atlantic Shippers' Board to Meet April 5-6

The Atlantic States Shippers Advisory Board will hold its 49th regular meeting on April 5 and 6 at the Arlington hotel, Binghamton, N. Y. The Freight Loss and Damage Prevention Committee meeting will be held on the evening of April 5 to accommodate merchandise receiving clerks, platform loaders and unloaders and supervisory freight handlers of the railroads and their customers. Pending legislation will be discussed on April 6 with special attention given to the so-called railroad omnibus bill. The International Business Machines Corporation will be host at a complimentary luncheon and inspection trip.

Annual Meeting Pacific Coast Transportation Advisory Board

The annual meeting of the Pacific Coast Transportation Advisory Board will be held at San Francisco, Cal., on March 24. Among the subjects to be considered are: Ways and means of co-operation between shippers and railroads to reduce transportation costs; adoption of appropriate action concerning pending legislation, both state and federal, that affects the mutual interests of shippers, consignees and railroads; presentation and analysis of economic indices which will depict the prospective business conditions during the second quarter of 1939; and ways and means of reducing opportunities for damage to freight in transit which creates irrevocable and irretrievable loss to all concerned.

N. E. Advisory Board to Meet March 27-28

The New England Shippers Advisory Board will hold its 29th regular and 14th annual meeting on March 27 and 28 at the Providence-Biltmore hotel, Providence, R. I. Among the subjects handled during the morning session on March 27 will be plans of the Freight Claim division, Association of American Railroads, for "perfect shipping and careful handling month," presented by R. A. Fasold, special representative of the division, and a discussion of the activities of the Railway Express Agency in freight loss and damage prevention by J. H. Butler, traffic executive, Railway Express Agency. The luncheon speaker on March 28 will be Donald E. Conn, executive vice-president of the Transportation Association of America.

Correction

In the table of Freight Operating Statistics of Large Steam Railways which appeared on page 213 of the January 28 issue of *Railway Age* several of the figures reported for the Pennsylvania System were in error. Total miles of road operated in November, 1938, should have been 10,000, as compared with 10,011 miles in November, 1937. Train miles for November, 1938, totaled 2,453,412, as compared with 2,685,971 miles in the same month in 1937. Locomotive Miles (Principal and Helper) were 2,977,608 in November, 1938, compared with 3,107,330 miles in November, 1937. Locomotive Miles (Light) for November, 1938, were 344,908, while corresponding figure for same month in November, 1937, was 354,403. Car Miles Loaded were 90,532 thousands, or 60.7 per cent, for November, 1938, as compared with 94,022 thousands, or 60.9 per cent, in November, 1937.

Gormley to Address Pacific Railway Club; Officers Elected

The Pacific Railway Club will hold its 22nd annual banquet and annual meeting on March 23 at the Mart Club, San Francisco, Cal. M. J. Gormley, executive assistant to president, Association of American Railroads, will speak on "Who Should Pay the Freight." A member of the California Railroad Commission will respond to the address. The following have been elected officers to serve during 1939: President, George E. Gaylord, superintendent, Southern Pacific; First Vice-President, A. M. Reinhardt, assistant freight traffic manager, Atchison, Topeka & Santa Fe; Second Vice-President, Leonard V. Newton, vice-president, Market Street Railway Company; Treasurer, C. F. Post, general purchasing agent, Western Pacific. William S. Wollner, who has been the club's executive secretary during its entire 22 years, will continue in that capacity. These men will be installed at the banquet.

Boston "Fans" Help Bring Old B. & M. Engine to N. Y. World's Fair

Members of the Railroad Enthusiasts, Inc., New England division, are currently engaged in scraping, cleaning and generally reconditioning locomotive No. 905 of the Boston & Maine in the old repair shop, yard 21, at Somerville, Mass., in order that the locomotive might be put in condition for exhibition at the New York World's Fair. Shortly the Boston & Maine will move No. 905 from Somerville to the Billerica shops where it will be manicured and shined and made to look as much as possible as it did in 1892 when it was built at the old Manchester (N. H.) Locomotive Works. Thus the locomotive will bear its original No. 494, an old style headlight, and a wooden pilot and cab, and both engine and tender will be gayly

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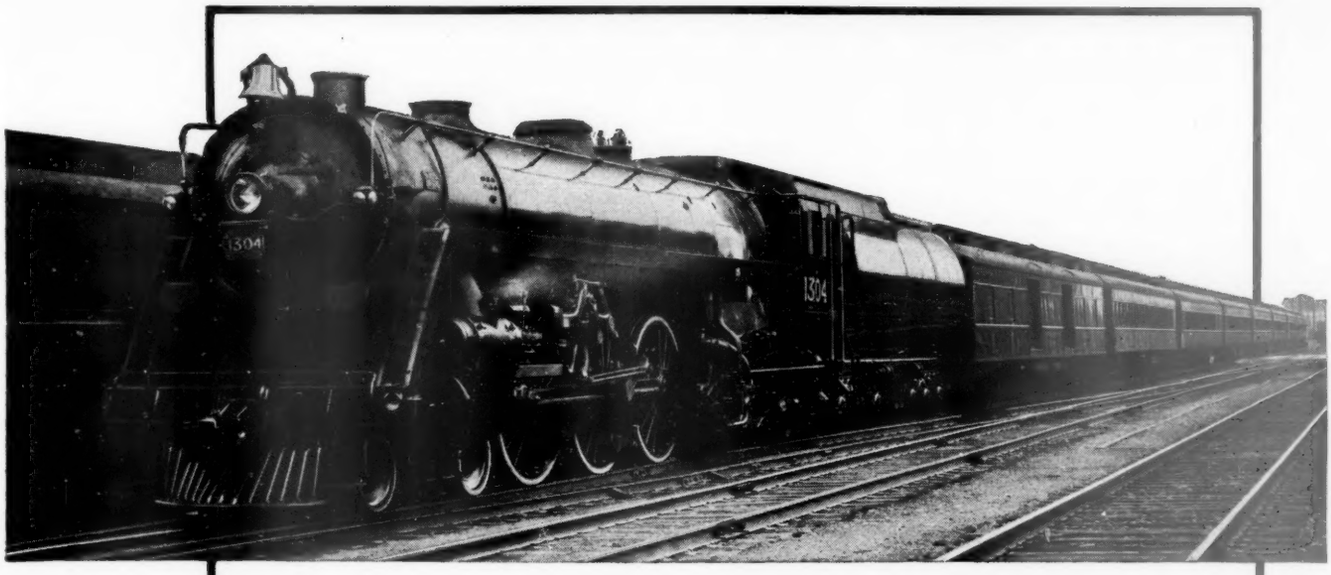

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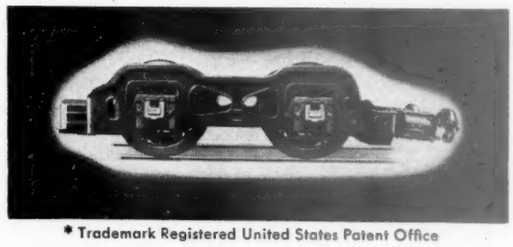
that modern locomotives must meet

1 A lower driving wheel load limit to suit high speed operation in relation to track.

2 High power output to pull the train at present-day speeds.

3 Limitation of starting power by the factor of adhesion.

These considerations have brought a new approach to the design of high-speed passenger locomotives. » » » The cylinders, pressure and driving wheels have been proportioned for the work to be done at the road speeds, using as few drivers as practical. » » » Leading and trailing trucks carry the remainder of the locomotive structure. » » » To restore the design to a proper balance, the deficiency in starting power is supplied by using The Locomotive Booster* to put idle trailer weight to work. » » » This insures minimum number of driving axles and minimum weight on drivers, resulting in a locomotive that is easier on track. » » »



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NEW YORK CHICAGO MONTREAL

painted; even the "Boston & Maine" on the tender will be scrolled. When this job is completed the locomotive will be transported to the New York fair where space at the railroad exhibit has been assigned.

N. Y. Central Prepares Rolling-Stock for World's Fair Business

For handling heavy passenger traffic for the New York World's Fair, the New York Central will soon put into operation 50 reconditioned coaches and 31 diners, all of which have been newly air-conditioned and improved. Twenty-five of the coaches have been completely redecorated in shades of gray and yellow, with blue upholstery, or tan and ivory with brown upholstery. The floors have been insulated against noise and a new lighting system installed. The 25 other coaches have been redecorated in shades of gray with blue-green upholstered seats and green-striped window curtains. By the air-conditioning of these cars and diners the New York Central's air-conditioned fleet will be brought to a total of 1046.

In addition the road has under construction 40 new light-weight Pullman cars of the type recently installed on the "Twentieth Century Limited" and 11 coaches of the type in service on the "Mercury." These are expected to be in service also for fair travel.

Lea Appoints Subcommittee

Chairman Lea of the House interstate and foreign commerce committee has appointed a subcommittee to consider S. 167, amending section 203 (b) of the Motor Carrier Act, and S. 25, prohibiting the operation of motor vehicles in interstate commerce by unlicensed operators. Both bills have passed the Senate. The members of the subcommittee are Representatives Pearson, Democrat of Tennessee, chairman; Boren, Democrat of Oklahoma; McGranery, Democrat of Pennsylvania; Reece, Republican of Tennessee; and Halleck, Republican of Indiana.

Chairman Lea has appointed another subcommittee to consider H. R. 3400, the through routes bill. The subcommittee is composed of Representatives Bulwinkle, Democrat of North Carolina, chairman; Kelly, Democrat of Illinois; Kennedy, Democrat of New York; Ryan, Democrat of Minnesota; Patrick, Democrat of Alabama; Wolfenden, Republican of Pennsylvania; Holmes, Republican of Massachusetts; and Wadsworth, Republican of New York.

Union Pacific Speeds Up Merchandise Service

The Union Pacific has speeded up a number of its merchandise services approximately 24-hr. Overnight service is now provided between Portland, Ore., and Boise, Idaho. The train leaves Portland at 6:45 p. m. Pacific time, and after nine station stops, arrives in Boise, 491 miles distant, at 10:20 a. m. Mountain time. The train also carries cars for Spokane, Wash., with arrival time of 7 a. m. Los Angeles-Salt Lake service has been speeded up, the train now leaving Los Angeles at 10:30 p. m. Pacific time, and arriving in Salt Lake, 778 miles distant, at 6:10 p. m. Mountain time, thus providing second morning delivery at Salt Lake and second afternoon delivery at Boise.

At the same time, service in the opposite direction has likewise been expedited, to provide for 11:25 p. m. departure from Salt Lake, and 5:25 p. m. arrival at Los Angeles the next night. The speeding up of service between Salt Lake and Pocatello, with departure at 7:05 p. m. and arrival at 12:30 a. m., provides overnight service to points in Idaho as far west as Glenns Ferry.

Santa Fe to Meet Greyhound Rates

Following the announcement of the Greyhound Lines that it would reduce fares in California on April 1, the Atchison, Topeka & Santa Fe on March 7 applied to the State Railroad Commission for permission to file tariffs on less than the thirty days statutory notice, to meet all announced Greyhound fare reductions. Greyhound's new fares are predicated on a sliding scale beginning at 1.8 cents per mile for distances of 1 to 50 miles; 1.7 cents per mile for distances of 51 to 100 miles, and progressively decreasing in multiples of 50 miles until a rate of 1.25 cents per mile for distances in excess of 400 miles is reached. In territory generally north of Sausalito and north and east of Stockton, the new Greyhound rates, initially based on 1.8 cents per mile up to 50 miles, replace the present 2 cents per mile basis generally effective throughout this territory, and rates for distances of 250 miles or less will remain higher than the flat 1.5 per mile rate now effective in competitive territory. The 1.5 cents per mile rate now charged by the Atchison, Topeka & Santa Fe, the Southern Pacific and the Greyhound in competitive territory for distances under 300 miles will remain unchanged.

Congress Gets More Railroad Bills

The annual Interior Department appropriation bill for the fiscal year ending June 30, 1940, carries no money for the Alaska Railroad as compared with an appropriation of $160,000 for the fiscal year ending June 30, 1939. The committee report says that it was anticipated that the railroad would be on a self-supporting basis during the coming fiscal year.

Senator King, Democrat of Utah, has introduced in the Senate S. 1700, a bill which would repeal the undistributed profits tax and change the rates on corporation taxes.

Senator La Follette, Progressive of Wisconsin, has offered S. 1784, a bill which would amend that section of the Railroad Retirement Act dealing with the definition of "years of service."

Senator Bone, Democrat of Washington, has introduced S. 1785, a bill which would amend the act authorizing the President to locate, construct and operate railroads in Alaska so that he would be empowered to purchase or construct tourist facilities in that territory.

Representative Healey, Democrat of Massachusetts, has introduced two bills, H. R. 4988 and 4989, which would amend the act entitled "An Act relating to the liability of common carriers by railroads to their employees in certain cases."

The President has signed S. 1102, extending the lending powers of the Reconstruction Finance Corporation to June 30, 1941.

Club Meetings

The next meeting of the Metropolitan Traffic Association of New York will be held at the Hotel Imperial, New York, on March 23. At that time R. A. Cook, manager, traffic department, American Newspaper Publishers Association and a member of the National Transportation Conference, will speak to the membership concerning the activities of the Conference in 1938-39.

The Eastern Association of Car Service Officers will hold its regular spring meeting on March 30 at the Ambassador hotel, Washington, D. C. Discussions will concern many subjects, an important one being a consideration of "The Short-Routing Project."

The Transportation Club of the Rochester (N. Y.) Chamber of Commerce will hold its next meeting on March 23 in the C. of C. building. Included in the items on the program will be a resume of transportation bills now before Congress by F. W. Burton, manager, transportation bureau, Rochester Chamber of Commerce. The entertainment feature will comprise a motion picture entitled "Orange Blossoming in Florida," presented by the Seaboard Air Line.

Fairman Dick Urges Class Rate Revision

Contending that the railroads should effect downward revisions in those high rates with which the motor trucks have been able to compete, counterbalanced "by almost microscopic readjustments in classifications which the trucks cannot touch," Fairman R. Dick, member of Dick & Merle-Smith, New York investment house, and chairman of the research committee of the Transportation Association of America, on March 16 addressed the Alleghany Regional Advisory Board at Pittsburgh, Pa., on the subject "Peanuts, Bananas and Railroads, or the Injustice of the Multiplication Table," in which he reviewed the steps toward recovering traffic lost to the highways. Because of high operating costs, approximating 2.4 cents per ton-mile, for a five-ton truck, the area of truck competition with the railroads is limited to about five per cent of the total railroad volume, the speaker pointed out. This diversion is due primarily to the established railroad principle of charging rates on the basis of the value of the commodity. Those expensive commodities which are charged transportation rates far in excess of the cost of such service, the trucks have been able to claim for themselves at a profit.

Mr. Dick suggests, therefore, that the railroads lower rates which "furnish the cream for the trucks" and in compensation therefor raise the rates on lower rated commodities to a small degree. On the whole, he is of the opinion that "we must recognize that heavy commodities must pay more of their own way than they have in

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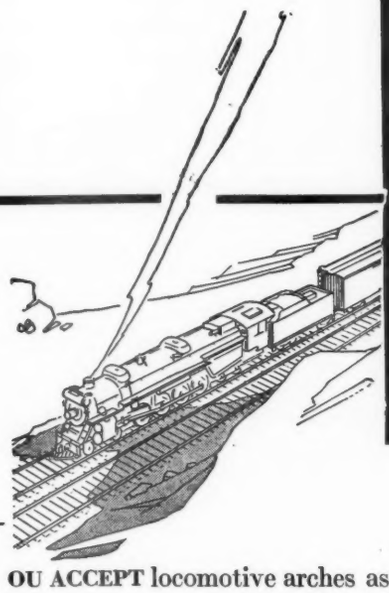

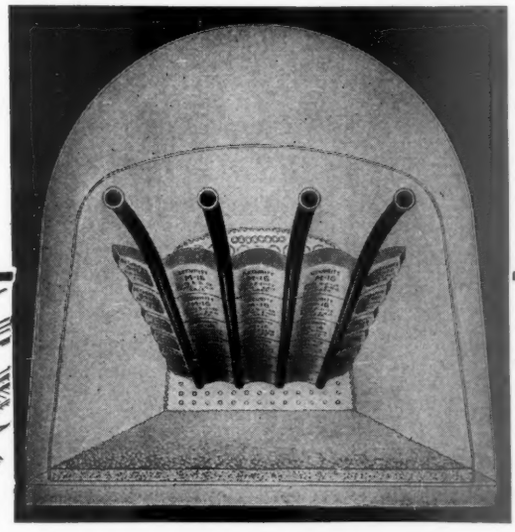

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the past" and that "as slight an increase as one-half mill per ton-mile on non-competitive traffic would be sufficient to safeguard railroad earning power and make possible the restoration of railroad credit."

Freight Car Loading

Revenue freight car loadings for the week ended March 11 totaled 591,691 cars, the Association of American Railroads announced on March 16. This was a decrease of 7,000 cars, or 1.2 per cent, under the preceding week, but an increase of 34,961 cars, or 6.3 per cent, above the corresponding week of 1938, and a decrease of 152,808 cars, or 20.5 per cent, below the same week in 1937.

As reported in last week's issue, the loadings for the previous week ended March 4 totaled 598,691 cars, and the summary for that week, as compiled by the Car Service Division, A. A. R., follows:

Revenue Freight Car Loadings

For Week Ended Saturday, March 4

Districts	1939	1938	1937
Eastern	135,052	122,793	168,365
Allegheny	117,448	104,265	154,678
Pocahontas	45,169	35,619	55,651
Southern	92,787	91,353	113,847
Northwestern	69,480	66,064	79,375
Central Western	95,204	86,190	105,349
Southwestern	43,551	46,608	53,064
Total Western Districts	208,235	198,862	237,788
Total All Roads	598,691	552,892	730,329
Commodities			
Grain and Grain Products	32,344	33,039	28,230
Live Stock	9,637	10,697	11,437
Coal	129,129	106,709	159,558
Coke	7,414	5,884	11,932
Forest Products	24,446	26,932	36,209
Ore	8,979	6,805	10,717
Merchandise L.C.L.	153,420	151,498	171,063
Miscellaneous	233,322	211,328	301,183
March 4	598,691	552,892	730,329
February 25	560,609	511,939	692,393
February 18	580,071	535,866	711,314
February 11	579,918	542,991	688,523
February 4	576,790	564,740	671,227
Cumulative Total, 9 Weeks	5,198,543	4,965,145	6,208,235

In Canada.—Carloadings for the week ended March 4 totaled 41,164 as compared with 45,690 a year ago and 39,879 in the preceding week, according to the weekly statement of the Dominion Bureau of Statistics.

Total for Canada	Total Cars Loaded	Total Cars Rec'd from Connections
March 4, 1939	41,164	23,827
February 25, 1939	39,879	22,111
February 18, 1939	39,886	22,933
March 5, 1938	45,690	23,229
Cumulative Totals for Canada:		
March 4, 1939	358,505	204,230
March 5, 1938	405,555	198,273
March 6, 1937	418,564	247,946

February Employment Above Same Month Last Year

Railway employment increased 1.31 per cent—from 929,770 to 941,979—during the one-month period from mid-January to mid-February, while the mid-February total was 0.32 per cent above that of February, 1938, according to the Interstate Commerce Commission's compilation, based on preliminary reports. The index number, based on the 1923-1925 average as 100 and adjusted for seasonal variation, stood at 54.8 for February—higher than that for any month since January, 1938, when it was 56. February, 1938's index number was 54.6.

February employment in all groups, save that embracing yardmasters, switch-tenders and hostlers (down 0.39 per cent) was up from the previous month; but all except maintenance of way and structures and maintenance of equipment and stores (up 3.03 per cent and 3.96 per cent, respectively) were off from the February, 1938 figures. The largest decline as compared with last year was in the professional, clerical and general group which was off 4.23 per cent; next in turn came executives, officials and staff assistants, off 3.88 per cent, and yardmasters, switch-tenders and hostlers, off 3.51 per cent.

The largest increase as compared with mid-January was reported for the maintenance of way and structures group; it was up 3.05 per cent, while transportation (other than train, engine and yard) and maintenance of equipment and stores forces were up respectively 1.83 per cent and 1.78 per cent.

L. N. E. R. Head Retires

Sir Ralph L. Wedgwood, chief general manager of the London & North Eastern (Great Britain) since 1923 and associated with a predecessor road since 1896, retired effective March 3 at the age of 65. Sir Ralph entered the service of the former North Eastern in 1896 at 22. Four years later he became assistant dock superintendent at West Hartlepool. In 1902 he was appointed a district superintendent and in 1904 became secretary of the company. In 1905 he was made district freight manager and later became chief freight traffic manager.

During the war Sir Ralph served in several capacities and in 1916 became director of docks under the director-general of transportation. At the termination of the war he returned to the North Eastern as chief freight and passenger traffic manager. In 1922 he became general manager. Upon amalgamation of the main line British railroads in 1923, he was appointed chief general manager of the newly-formed London & North Eastern. Chief amongst his special duties have been his membership in the Weir Committee on main line electrification in 1930 and 1931 and his chairmanship of a committee of inquiry into the affairs of the Indian railways. His latest responsibility was in heading the railroads' "square deal" campaign as chairman of the Railway General Managers' Conference in 1938, and it is reported that he is continuing his participation in the campaign after retirement.

He is succeeded by C. H. Newton, divisional general manager, Southern Area, of the L. N. E. R.

Court Kills Pennsylvania Full Crew Law

The Railway Full Crew Act placed on the statutes of Pennsylvania on June 1, 1937, has been invalidated by a decision of the Dauphin County Court at Harrisburg in a decision by Judge J. E. Fox. The decision holds the act to be a violation of the commerce clause of the federal Constitution, an improper exercise of the police power, and an interference with interstate commerce. It also finds that the expenses entailed by conformity with the act would be out of proportion to the alleged advantages of safety.

The act, which required such use of extra man-power as two employees at the head end of electrically-propelled trains, baggagemen on locked cars and additional brakemen on freight and passenger trains of prescribed lengths, was attacked originally by the Pennsylvania which secured a temporary injunction in the Dauphin County Court of Common Pleas immediately after passage of the act. The injunction was appealed by the state in the state Supreme Court which court, in a decision in June, 1938, upheld the temporary injunction and returned the case to the court of original jurisdiction.

Suggests C. N. R. Terminal Work Be Held Up

Independent engineers should make a careful investigation of the Canadian National Terminal plan at Montreal before the project proceeds any further, Sir Edward Beatty, president of the Canadian Pacific, has suggested to the Dominion Government.

The engineers, said, Sir Edward in a letter to Prime Minister Mackenzie King dated last January 5, "should be asked to advise the Government if the passenger terminal requirements of the Canadian National in Montreal could be more economically met by an extension of the present Canadian Pacific terminals than by the construction of a new and independent one."

Mr. Mackenzie King replied that the views of the Canadian Pacific president would be transmitted to Transport Minister Howe and also laid before the Cabinet.

Car-Over-Cab Operations Found Not Unsafe

Division 5 of the Interstate Commerce Commission, following the proposed report of Examiner Snow which was reviewed in the *Railway Age* for December 10, 1938, page 853, has found that the use of motor vehicles in the transportation of automobiles which are so constructed that all or part of one of the automobiles being transported protrudes over the cab of the carrying vehicle is not unsafe.

The commission's decision points out the fact that the conclusions reached are not in harmony with the law in Pennsylvania which prohibits the operation of vehicles of this type. It goes on to say that although the commission requested the cooperation of Pennsylvania in the hearing, it obtained no response with the result that the state was not represented at any time during the progress of the case.

"While we agree that the burden of obtaining an adequate record is upon us", says the decision, "nevertheless we feel that we have not had the cooperation in this matter from the Commonwealth of Pennsylvania which might reasonably have been expected, and which we normally receive from State authorities, including those of a sovereign State with ample resources and concerned, equally with the Federal Government, with the public welfare."

The commission will watch the opera-

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Ton Mile Per Hour Production

Mere ability to drag cars at slow speed no longer measures locomotive earning capacity.

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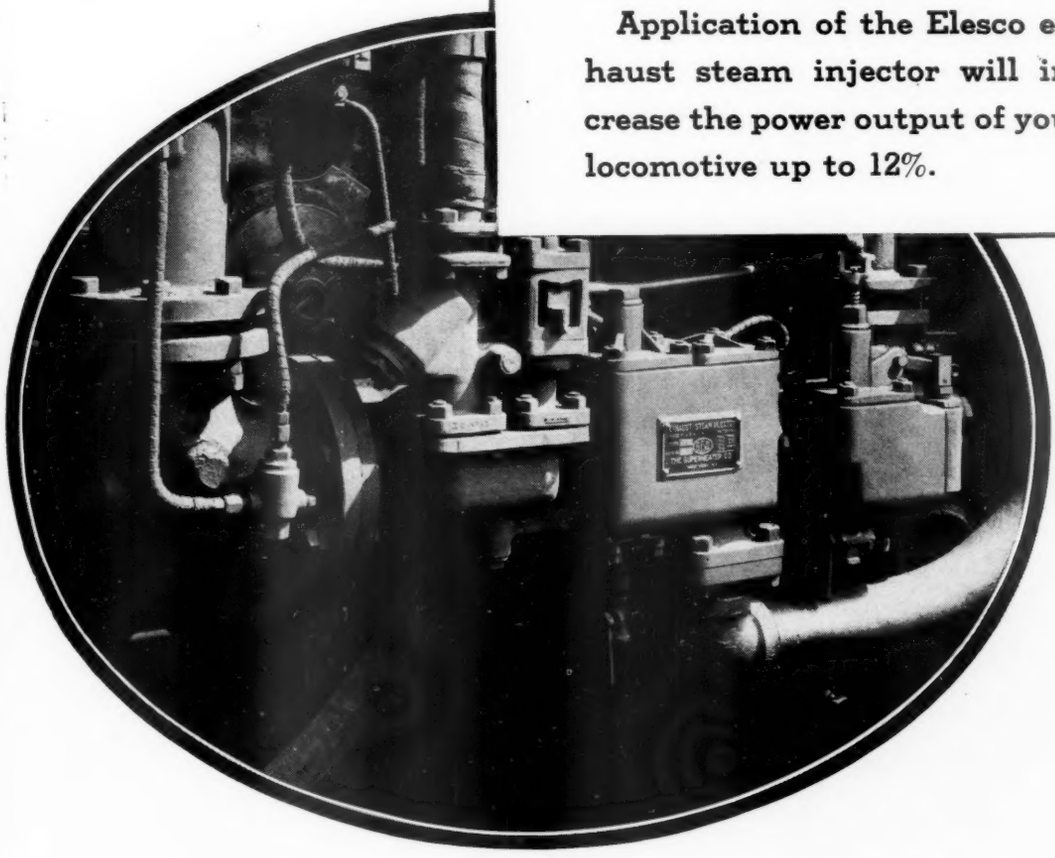

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tions of this type of carrier and if it finds that at any time there is evidence contrary to its findings, it will reopen the case for further hearing.

A dissent was noted by Commissioner Lee, but no reasons were given for his action.

Crossing Accidents in 1938

Fewer persons lost their lives in accidents at highway-railroad grade crossings in 1938 than in any year since 1915, with the exception of one year—1933—according to the Safety Section of the Association of American Railroads.

Fatalities resulting from highway-railroad grade crossing accidents in 1938 totaled 1,517. This was a decrease of 358 compared with the number which took place in 1937 and a decrease of 269 compared with 1936. In 1933 there were 1,511 fatalities.

The number of fatalities in 1938 was a reduction of 1,051 compared with the peak year in 1928, when 2,568 persons lost their lives in such accidents.

The reduction in the number of fatalities took place despite an increase in the number of automobiles in operation over the highways of this country. For every person killed in a grade crossing accident in 1938, there were approximately 20,000 automobiles registered, compared with 15,843 automobiles in 1937, and 6,137 in 1921. In 1933 there was one fatality for every 15,780 automobiles registered.

Persons injured in highway-railroad grade crossing accidents in 1938 totaled 4,018, a decrease of 1,118 compared with the preceding year and a decrease of 912 persons compared with 1936. The number of persons injured in 1938 was less than in any preceding year since 1916, with the exception of 1932 and 1933.

In 1938 there were 3,493 grade crossing accidents, a decrease of 996 compared with 1937, and a decrease of 784 compared with 1936.

This reduction in the number of fatalities caused by grade crossing accidents, the A. A. R. says, "has been due, at least in part, to the campaign which the railroads and various safety organizations have conducted to impress upon the public the necessity for exercising greater precaution in approaching and passing over highway-railroad grade crossings. This campaign has been especially intensive in recent years due to the increasing number of motor vehicles in operation. Had the ratio of fatalities caused by grade crossing accidents to automobiles been the same in 1938 as in 1921, the number of deaths in the past year would have been approximately 4,950 compared with 1,517, the actual number which did occur."

National Conference on "Interstate Trade Barriers"

"The Bureau of Agricultural Economics was informed today that a National Conference on Interstate Trade Barriers has been called by the Council of State Governments, to be held at Chicago, April 5, 6 and 7, in an effort to halt the erection of 'tariff barriers among the several States'," said a March 9 press release from the Department of Agriculture.

The Council is composed of state governors, commissioners, and legislators who resolved in a general assembly at Washington, D. C., in January that "interstate trade barriers, under whatever guise, are detrimental to the economic welfare of the country." Forty-six of the 48 States were represented at the Assembly.

Officials of the Bureau of Agricultural Economics quoted a letter from Frank Bane, executive director of the Council, that committees dealing with various phases of the barriers problem have been established by the Council, and inviting Dr. F. V. Waugh in immediate charge of the Bureau's investigations of trade barriers to serve as a member of the Committee on Agriculture.

Mr. Bane reported that "scores of additional bills, extending these trade barriers, are pending in many of the 42 State Legislatures now in session." He added "all agree that this movement, if not halted, will undermine one of the basic principles set forth in the Constitution, a principle upon which our prosperity and well-being largely depends."

The letter stated that "the Governors' Conference, in session at Oklahoma City last September, concerned about this situation, authorized its chairman to announce that the group unanimously opposed the principle of State trade barriers and were of the opinion that such barriers between the States should be removed."

The General Assembly at Washington, Mr. Bane said, "recommended complete adherence to the traditional American policy of free trade among the states. The Assembly further resolved that the secretariat of the Council of State Governments should study legislation and policies which tend to create such barriers and to restrict the free flow of commerce and should call, at the earliest practical time, an interstate conference on this subject."

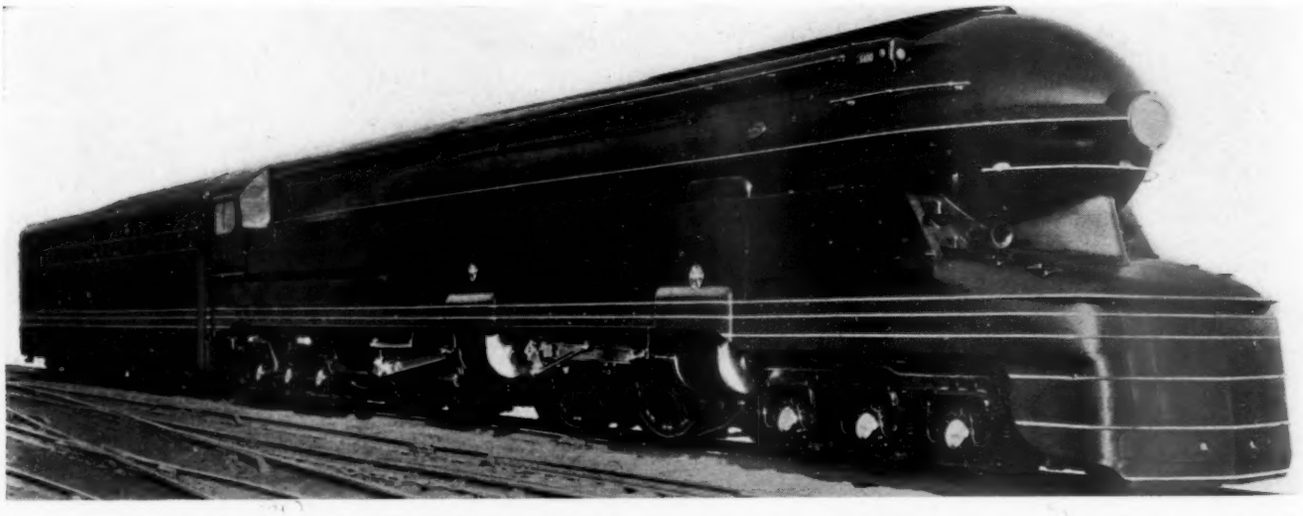
The National Conference to be held at Chicago is in pursuance of this resolution. A special report, "Barriers to Internal Trade in Farm Products," prepared by the Bureau of Agricultural Economics was submitted to Secretary Wallace last week, as noted in the *Railway Age* of March 11.

Representative Cannon, Democrat of Missouri, has introduced in the House of Representatives a resolution (H. Res. 122) which would authorize the speaker of the House to appoint a select committee of five members "for the purpose of considering and making legislative recommendations with respect to the problems presented by a special report submitted to the Secretary of Agriculture on March 7, 1939, by the Bureau of Agricultural Economics under the title 'Barriers to Internal Trade in Farm Products.'"

New Four-Cylinder Locomotive Settled at N. Y. World's Fair

The Eastern railroads' new four-cylinder passenger locomotive, which was recently completed, arrived at the New York World's Fair on March 13 on the tracks of the Long Island and was installed on its foundation at the railroad exhibit.

The new locomotive and tender together extend 140 ft. in length and weigh 526 tons. The locomotive, the first in the world to carry the wheel classification 6-4-4-6, develops 6,500 hp. at 100 m. p. h. Its tender rests upon two 8-wheel trucks



This Giant Four-Cylinder Passenger Locomotive Carries Six-Wheel Leading and Trailer Trucks and a 16-Wheel Tender. It Was Built By the Pennsylvania at Altoona, Pa., and Has Just Been Placed for Exhibit at the New York World's Fair

Continued on next left-hand page

APPLICATION of HUNT-SPILLER *Air Furnace* GUN IRON Wear-resisting parts will make a better revenue producer out of any locomotive.

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Duplex Sectional Type Packing
for Cylinders and Valves
(Duplex Springs for Above
Sectional Packing)
Cylinder Snap Rings
Valve Rings All Shapes
Light Weight Valves
Cylinder Liners and Pistons
for Diesel Service

HUNT-SPILLER GUN IRON

Air Furnace

and has capacity for 24,500 gal. of water and 25 tons of coal. The locomotive has a tractive force of 76,400 lb. and a boiler surface of 7,748 sq. ft. and operates at a steam pressure of 300 lb. per sq. in. In general style, it is similar to the streamlined "Pacific" type K-4 class passenger locomotive now in operation on the Pennsylvania.

While the locomotive was built at the Pennsylvania's Altoona (Pa.) shops and was designed for operation on that road, for the duration of the fair it will bear on its tender the signature "American Railroads," in line with the policy established by the committee of Eastern carriers in charge of railroad exhibits at the fair.

Retirement Board Recasts Organization; Announces New Appointments

The appointment of personnel to fill "some of the key positions" in its organization was announced by the Railroad Retirement Board on March 14. At the same time the Board indicated that its entire organization had been recast so as "to integrate the administration of the retirement and unemployment insurance systems."

"The plan for integrating the Board's functions," the announcement says, "is based on the fact that the Railroad Retirement Act and the Railroad Unemployment Insurance Act cover the same industry and the same workers and that, therefore, effective management requires that the operation of the two acts be knit together as closely as possible. Payment of benefits under the Railroad Unemployment Insurance Act, enacted by Congress last June, begins July 1, 1939. The new organization plan establishes the machinery for paying those benefits.

"The plan groups the administrative units of the Railroad Retirement Board into Staff and Operations branches. The Staff Branch will include the following bureaus: Law; Research and Information; General Control; and Audits and Investigations. The Operations Branch will consist of four bureaus: Employment and Claims; Wage and Service Records; Administrative Services, and Prior Service Records.

The appointments announced by the Board are as follows:

James G. Robinson, who was appointed last September as director of unemployment insurance, will serve, in addition, as "coordinator of operations."

Walter J. Couper of New Haven, Conn., as director of employment and claims. Mr. Couper was formerly assistant professor of economics, Yale University.

J. Lindsey de Valliere of Trenton, N. J., as assistant director of employment and claims. Mr. de Valliere has served the state of New Jersey as chief auditor and deputy state tax commissioner.

Glendon J. Mowitt of Saginaw, Mich., as controller, in charge of the Bureau of General Control. Mr. Mowitt has been chief budget examiner of the State of Michigan.

Walter Matscheck of Kansas City, Mo., as chief inspector. Mr. Matscheck has been a member of the staff of the Committee of Public Administration and Committee on Social Security of the Social Science Research Council.

Charles L. Hodge of St. Louis, Mo., as director of the Division of Employment Service. Mr. Hodge was formerly secretary of the Railroad Retirement Board and director of the Bureau of Administration. Previously he had been economist for the Order of Railroad Telegraphers.

Canadian Senate to Probe Railways

The Dominion Senate will resume its probe of Sir Edward Beatty's plan of unified management of the Canadian roads. Charles Beaubien, Montreal Conservative, who initiated this inquiry last session, moved again for its continuance this session and the motion was carried in the upper house at Ottawa last week with little debate.

Raoul Dandurand, government leader in the Senate, made it plain, though, that as the Conservative party of which Beaubien is a member, went on record last July against as opposed to amalgamation of the two railways, there would be little attention paid in the probe this session to unification but much to "co-operative" savings.

Parliament, in other words, is back to where it was when in 1933, under the Bennett regime, it passed the Canadian Pacific-Canadian National Railways Act providing for what was called compulsory co-operation. The bill provided that the transport board could be invoked by either road to force agreement with the other on some carefully considered project for joint savings. But last session in the Senate probe it was shown that this part of the bill, the only part containing teeth, was never invoked, that whatever joint savings had been made were voluntary.

Another phase of the situation is presented by the activity of what is known as the Citizens' Group for Railway Action with headquarters in Toronto. It has been sending out a flood of pamphlets for some time. Senator James Murdock said he would like to have its source and support identified.

Said Senator Dandurand: "We can ask the Canadian National and the Canadian Pacific what they have done since the 1st of July in the way of co-operation. We want full light upon the administration of the Canadian National, but we want for our own railway a certain measure of fair play. They have not raised their voices, but we know the Publicity Bureau of the Canadian Pacific and Sir Edward Beatty are constantly on the job and constantly stressing the fact that the Canadian National is losing large sums of money. I think the Canadian Pacific representatives would appear in a better light if they were candid about their campaign and spoke of their own needs. We shall discuss these matters when we go into committee. I simply raise my voice now to say that a constant campaign, an organized campaign, has been carried on against the Canadian National with a view to bringing about unified management."

Public hearings will be opened by the committee on March 21 when Professor J. L. McDougall, of Queen's University, Kingston, Ont., and C. W. Peters, Calgary, will be heard. Professor McDougall will submit evidence on wages and working conditions of railway workers, and Mr. Peters will present a picture of the relation of the railways to agriculture. The two railways have been asked to prepare statements on what progress has been made in co-operative economies since the passage of the 1933 legislation. As last session the joint chairmen will be Senator Charles Beaubien, Conservative, and Senator George P. Graham, former Liberal Minister of Railways.

M. S. Sloan Raps Rate Structure

(*Continued from page 497*)

"I do not mean to suggest that our traffic officers and solicitors—the railroads' sales managers and salesmen—are anywhere near as free agents as are the men who hold similar positions with the truck and bus lines, nor that they are not possessed of equal or superior ability, but—even handicapped as we are—a better job might have been done; and must be done, on the selling side of our business, while we are awaiting the enactment of legislation that will make us freer agents in meeting our newer competition.

"I hope nothing I have said will be taken as suggesting there is no need for legislation in working out a solution of the transportation problem. I hold a view quite to the contrary. The railroads can no longer be charged with having no program. They have concrete and comprehensive proposals, which are embodied in the report recently made to the President by the Special Committee-of-Six selected by him to submit a program.

"Incidentally, the fourth section of the transportation act should be cleared of its present absurdities, as the so-called Pettengill amendment proposes. In a word, the carriers should be empowered to meet the market and to keep order among themselves without interference from the anti-trust law."

Whitney Makes a Long Nose at Committee-of-Six Report

President A. F. Whitney of the Brotherhood of Railroad Trainmen reiterates his strongly expressed dislike for the report of the Committee-of-Six submitted to President Roosevelt on December 23, 1938, and summarized in the *Railway Age* for December 31, page 944) in an item appearing in the president's department of the current issue of the "Railroad Trainman." Writing therein he makes no secret of his opinion that those labor leaders who affixed their signatures to the report and those who later gave their approval either "knew not what they were signing" or else attached their signatures "via the rubber stamp plus a little pressure from the unseen hand of the railroad banker." He declares that "at a time when the railroad workers of the country are looking to their official spokesmen for leadership the labor executives fail them."

Mr. Whitney believes that "nowhere in the report is there to be found the correct

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and fundamental solution to the 'railroad problem'." His particular bone of contention is that the "doctors" prescribed "bloodletting," which he describes as "throwing more men out of work by giving the industry a dose of consolidation." He feels that there is no more harmful proposal than this, but solaces himself with the thought that nothing else could be expected of "quacks."

He then quotes from "Railroad Notes," a publication of the Labor Research Association of New York. Herein it is stated that the report of the Committee-of-Six fails to attempt to deal with overcapitalization and the financial malpractices of the railroads; that it nowhere mentions limitation of dividends or restriction of funded debt; that the signers of the report failed to safeguard employees and the public in advocating government loans without the condition of a general rehabilitation program for the industry; in agreeing that the railroads be permitted to set their own rates; in overlooking the "social costs" involved in the whole matter of consolidation. In fact, quotes Mr. Whitney, "the interest of the public is almost completely disregarded."

Hastings Urges A. A. R. to Adopt Postalized Fares

John A. Hastings, leading exponent of postalized fares, announced on March 10 that he had asked the Association of American Railroads to adopt a specific schedule of postalized fares in place of its recently announced "Semi-Postalized Grand Circle Rate Scheme" by which "a coach rate of $90 to the two World's Fairs was fixed, regardless of the distance that one traveled over 6,000 miles." Although admitting that the $90 rate was lower than existing rates, Mr. Hastings said that it is still out of the reach of millions of Americans who might want to visit one or both of the World's Fairs.

In a statement released with his new postalized fare schedule Mr. Hastings contended that "By their $90 'rate scheme' the railroads restrict and limit the possible use of railroad facilities to less than eight per cent of our total population. The railroads are making the same mistake with this 'rate scheme' that they made last July, when they increased coach fares to the East to 2½ cents per mile. Immediately after that 'rate scheme' became effective revenues and passenger travel substantially declined, and it is still on the down-grade, because by the high rate they limited their market."

Mr. Hastings believes that his postalized fare plan will appeal "to millions" and goes on to show how it will permit a resident of Washington, D. C., to go to the Golden Gate Exposition at San Francisco and return to Washington for a coach fare of $25. The fare to the New York Fair would be only $2.50.

Postalizer Hastings argues that the railroad is essentially a mass transportation agency, and that to be profitably operated it must do a mass, volume business. "Experience," he contends, "proves that this can only be accomplished by low rates. The low uniform postalized fare will induce the greatest possible use of our rail facilities. It will produce mass travel and at rates high enough to assure profits for the railroads."

Mr. Hastings concludes his statement by warning that should the A. A. R. refuse to accept his plan, he will petition the Interstate Commerce Commission to direct its adoption.

The latest version of Mr. Hastings plan provides for the division of the country into 10 zones which would radiate out from Washington, D. C. Under the postalized fare plan the rate to Pittsburgh, Pa., which is in zone 1, would be $1.25 as compared with the present rate of $7.53 for coach travel. Each zone the traveler entered would increase the fare by $1.25 with the result that the fare to San Francisco, which is in the 10th zone, would be $12.50 as compared with the present coach fare of $50.13. Suburban fares would be postalized at $.15 for a single trip and $.25 cents for a round trip on those railroads now regularly operating a suburban service to and from large metropolitan areas. On those railroads not now regularly operating a suburban service to and from metropolitan areas, Mr. Hastings would fix the fare at $.25.

Operating Revenues and Operating Expenses of Class I Steam Railways

Compiled from 136 Monthly Reports of Revenues and Expenses Representing 140 Class I Steam Railways
(Switching and Terminal Companies Not Included)
FOR THE MONTH OF JANUARY, 1939 AND 1938

Item	United States		Eastern District		Southern District		Western District	
	1939	1938	1939	1938	1939	1938	1939	1938
Miles of road operated at close of month	233,825	234,854	57,643	58,012	44,520	44,719	131,662	132,123
Revenues:								
Freight	$246,802,584	$218,304,821	$104,928,684	$87,949,466	$52,667,739	$46,066,024	$89,206,161	$84,289,331
Passenger	34,785,495	37,427,990	19,454,919	20,608,947	5,328,517	6,002,360	10,002,059	10,816,683
Mail	7,925,906	7,865,774	2,989,706	2,959,727	1,426,505	1,424,660	3,509,695	3,481,387
Express	3,357,044	2,421,475	1,215,279	738,081	881,209	562,714	1,260,556	1,120,680
All other operating revenues	12,897,738	13,088,325	6,495,594	6,421,743	1,735,182	1,823,108	4,666,962	4,843,474
Railway operating revenues	305,768,767	279,108,385	135,084,182	118,677,964	62,039,152	55,878,866	108,645,433	104,551,555
Expenses:								
Maintenance of way and structures	31,375,988	30,585,245	12,537,923	11,949,935	6,627,501	6,299,345	12,210,564	12,335,965
Maintenance of equipment	62,105,960	58,281,255	27,251,115	24,460,145	12,094,880	11,257,407	22,759,965	22,563,703
Traffic	8,514,221	8,689,054	2,976,136	3,099,138	1,735,310	1,732,560	3,802,775	3,857,356
Transportation—Rail line	116,728,400	120,029,345	52,827,897	53,325,328	20,336,233	20,675,512	43,564,270	46,028,505
Transportation—Water line	373,347	414,993	.....	.....	.....	.....	373,347	414,993
Miscellaneous operations	3,179,066	3,501,950	1,441,541	1,612,812	489,271	519,032	1,248,254	1,370,106
General	10,838,662	11,217,693	4,338,891	4,400,800	2,049,675	2,154,550	4,450,096	4,662,343
Transportation for investment—Cr.	169,194	154,179	16,966	29,103	35,766	27,913	116,462	97,163
Railway operating expenses	232,946,450	232,565,356	101,356,537	98,819,055	43,297,104	42,610,493	88,292,809	91,135,808
Net revenue from railway operations	72,822,317	46,543,029	33,727,645	19,858,909	18,742,048	13,268,373	20,352,624	13,415,747
Railway tax accruals	29,086,401	28,615,863	11,979,585	11,577,673	6,367,991	6,136,466	10,738,825	10,901,724
Railway operating income	43,735,916	17,927,166	21,748,060	8,281,236	12,374,057	7,131,907	9,613,799	2,514,023
Equipment rents—Dr. balance	7,908,591	7,815,325	3,694,371	3,363,591	515,622	419,899	3,698,598	4,031,835
Joint facility rent—Dr. balance	2,936,614	2,967,805	1,609,739	1,642,732	333,273	318,554	993,602	1,006,519
Net railway operating income	32,890,711	7,144,036	16,443,950	3,274,913	11,525,162	6,393,454	4,921,599	d 2,524,331
Ratio of expenses to revenues (per cent)	76.2	83.3	75.0	83.3	69.8	76.3	81.3	87.2
Depreciation included in operating expenses	16,804,310	16,753,962	7,312,962	7,298,875	3,326,499	3,263,522	6,164,849	6,191,565
Pay roll taxes	8,462,932	8,477,646	3,691,228	3,611,765	1,529,438	1,546,925	3,242,266	3,318,956
All other taxes	20,623,469	20,138,217	8,288,357	7,965,908	4,838,553	4,589,541	7,496,559	7,582,768

d—Deficit or other reverse items.
Compiled by the Bureau of Statistics, Interstate Commerce Commission. Subject to revision.

Equipment and Supplies

FREIGHT CARS

JOHN MORRELL & Co., have ordered 100 refrigerator cars from the General American Transportation Corporation. Inquiry for this equipment was reported in the *Railway Age* of January 21.

THE INTERSTATE COMMERCE COMMISSION in a decision by Commissioner McManamy has authorized the General American Transportation Corporation to construct 30 additional fusion-welded tank cars for experimental service in the transportation of caustic soda solution.

THE DENVER & RIO GRANDE WESTERN, reported in the *Railway Age* of January 28 as considering the purchase of 700 cars, is now inquiring for 250 steel-sheathed automobile cars 40 ft. 6 in. long of 50 tons' capacity; also for 250 box cars of the same construction and capacity and 100 mill-type gondola cars, 60 ft. long of 70 tons' capacity.

PASSENGER CARS

THE LEHIGH VALLEY has ordered 10 coaches from the Pullman-Standard Car Manufacturing Company.

THE DELAWARE & HUDSON has ordered 6 passenger coaches from the Amercan Car & Foundry Company. Inquiry for this equipment was reported in the *Railway Age* of February 11.

THE CHICAGO, ROCK ISLAND & PACIFIC has awarded contracts for building two streamlined Rocket trains, to cost $1,200,000. While formal contracts have not been signed, the ten light-weight coaches, dining cars and head end cars will be built by the Edward G. Budd Manufacturing Company; the six Pullman sleeping cars, including the Pullman observation car, will be built by the Pullman-Standard Car Manufacturing Company; and the two Diesel-electric locomotives will be built by the Electro-Motive Corporation.

IRON AND STEEL

THE NEW YORK CENTRAL SYSTEM has ordered 56,200 gross tons of rail, together with the necessary track accessories at a cost aggregating approximately $4,000,000. The rail order was divided among the following companies: Bethlehem Steel Company, Carnegie-Illinois Steel Corporation, Inland Steel Company and Algoma Steel Corporation, Ltd.

SIGNALING

UNION PACIFIC.—Sealed proposals will be received at the office of E. L. Fries, general purchasing agent of this road, Omaha, Nebr., until 12 o'clock noon (c.s.t.) April 6, for furnishing the necessary material for 13 or more railroad grade crossing protective devices to be installed under the federal grade crossing program in the State of Utah.

Construction

CHICAGO, ROCK ISLAND & GULF.—A contract for the construction of an overpass for state highway No. 117 over one track of this road 6.5 miles north of Stinett, Tex., amounting to $14,982 has been awarded the Amarillo Bridge Company, Amarillo, Tex., by the Texas State Highway Department. The structure will consist of three 40-ft. I-beam spans resting on concrete abutments supported on precast concrete piling and spread footing-type concrete interior bents.

INTERNATIONAL GREAT NORTHERN.—A contract has been awarded the Gifford-Hill Company, Dallas, Tex., by the Texas State Highway Department amounting to $38,480 for the construction of a four-lane overpass for state highway No. 64 over one track of this road in Tyler, Tex. The structure will consist of four 48-ft. I-beam spans supported on concrete spread-footing type abutments and interior bents.

MISSOURI-KANSAS-TEXAS.—A contract amounting to $47,949 has been awarded C. B. Bellar Co., Anahuac, Tex., by the Texas State Highway Department for the construction of an overpass for U. S. highway No. 75 over two tracks of this road in Dallas, Tex. The structure will consist of one 51-ft. and four 45-ft. I-beam spans supported on concrete spread-footing type abutments and concrete interior bents on concrete foundation piling.

PENNSYLVANIA.—Contracts have been let by this road for improvements as follows: To the Empire Construction Company for an extension to Pier No. 5, Baltimore, Md.; Collier Construction Company, for car dumper and transmission lines at Sandusky, Ohio; James Stewart & Co., restaurant and bar at Pennsylvania Station, New York; Rust Engineering Company, nine-stall addition to enginehouse at Oil City, Pa.; W. F. Trimble & Sons Co., for remodeling warehouse at Pittsburgh, Pa.

SOUTHERN PACIFIC.—Granfield, Farrar & Carlin, San Francisco, Cal., with a bid of $296,000, were low bidders on the construction of earthwork and structures from milepost 282.80 to milepost 287.81 and the relocation of 2.53 miles of U. S. Highway No. 99, including a grade separation structure. This is a part of the 30 mile relocation of the Southern Pacific around the Shasta Reservoir Site north of Redding, Cal., the Central Valley Project of the Bureau of Reclamation. The work includes approximately 787,000 cu. yd. of earth and rock excavation, 1,675 cu. yd. of concrete and the erection of 150,000 lb. of structural steel. This company was also the low bidder on the first 12½ miles of this work, as announced in the *Railway Age* of October 8.

WABASH.—Two contracts for the construction of a highway overpass over two tracks of the Wabash about 2 miles northeast of Mitchell, Ill., have been awarded by the State of Illinois Division of Highways. The contract for the substructure, amounting to $55,426, was awarded Maurice Hoeffken & Company, Belleville, Ill., and for the superstructure, amounting to $17,625, to St. Louis Structural Steel Company, East St. Louis, Ill. The bridge consists of five I-beam spans, two 85 ft. long, one 70 ft., one 69 ft. and one 63 ft. long, with a concrete deck and reinforced concrete substructure.

Supply Trade

General American Transportation Corporation

The annual report of the General American Transportation Corporation and its subsidiaries for 1938 shows a net profit of $3,004,899, as compared with $4,542,655 in 1937. Gross income from sales and rentals totaled $27,090,181, compared with $45,935,454, leaving an operating profit before depreciation of $9,974,809 in 1938 and $11,441,479 in 1937. Current assets totaled $11,251,989 while current liabilities totaled $2,736,708. Total assets of the company were $100,701,488.

The Beckwith Machinery Company, Pittsburgh, Pa., has been appointed representative of the **Bucyrus-Erie Company,** Milwaukee, Wis.

H. A. Marshall, eastern representative, railroad department, of the **National Aluminate Corporation,** Chicago, with headquarters at New York, has been promoted to assistant to vice-president, with the same headquarters.

Ralph F. Heath, representative of **Manning, Maxwell & Moore, Inc.,** at New Orleans, La., has been appointed sales representative at Houston, Tex., and **J. Schuyler,** for the past five years connected with the company's Los Angeles, Calif., branch office, is now sales representative at New Orleans.

Harvey B. Jordan, assistant vice-president of the **American Steel & Wire Co.** (subsidiary of the United States Steel Corporation), has been appointed vice-president in charge of operations, with headquarters at Cleveland, Ohio. He succeeds **M. W. Reed,** who has been made chief engineer for the **Carnegie-Illinois Steel Corporation.**

James H. Robins has been elected president and a member of the board of directors of the **American Pulley Company,** Philadelphia, Pa., in active charge of the company's affairs; **Charles E. Brinley,** former president, having been elected president of the **Baldwin Locomotive Works** as was announced in the *Railway Age* of December 24 and 31, 1938. Mr. Brinley will be associated with the American Pulley Company as chairman of its board of directors.

Leigh B. Block, assistant vice-president and assistant manager of sales of the flat rolled steel division of the **Inland Steel Company,** Chicago, has been elected vice-president in charge of purchases, to suc-

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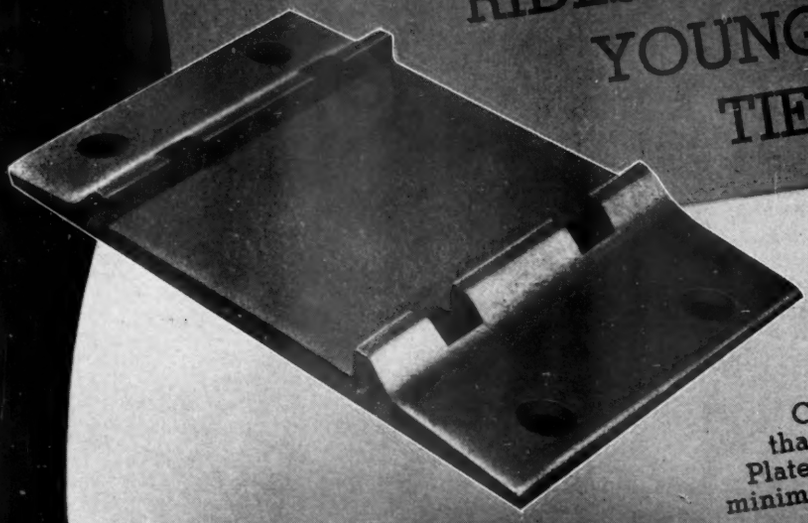
Mercury... TRAIN OF TOMORROW

RIDES *TODAY* ON YOUNGSTOWN TIE PLATES



ADD the Mercury (and the Twentieth Century) of the New York Central to the long list of big name trains that rely and depend on Youngstown Tie Plates for accurate gauge maintenance and minimum wear on the ties.

Youngstown makes tie plates as a specialty. The ore is carefully selected, and each order is manufactured separately, from soft, medium or hard grade new billet steel according to exact specifications. Punching is accurate, bottoms are level, with each plate individually gauged and inspected before shipping. Youngstown Tie Plates, made to specification, will strengthen and improve your track at low cost.

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RAILROAD MATERIAL

YOUNGSTOWN

Also for the Transportation field -- Youngstown's YOLOY high tensile steel is a proven product assuring weight reductions of 25% to 35% and an increase of 10% in strength. Write for Bulletin describing YOLOY.

ceed **E. J. Block,** who died on March 5. Mr. L. B. Block began his business career at the Indiana Harbor works of the Inland Steel Company in 1924. He entered the purchasing department at that plant in

Leigh B. Block

1927, and became works purchasing agent in 1928. In 1932, he was transferred to the flat rolled steel division in the sales department at the company's general offices in Chicago, and in 1934 was appointed assistant vice-president and assistant manager of sales of that division.

Chester H. Butterfield, general sales manager of the locomotive equipment division of **Manning, Maxwell & Moore, Inc.,** Bridgeport, Conn., has been elected vice-president and general sales manager of the industrial and railroad divisions to fill the vacancy caused by the death of W. P. Bradbury. Mr. Butterfield began work with the company in 1917, in the engineering department of the Hancock Valve plant at Boston, Mass. In 1925 he was appointed sales representative of the railroad division in the New England territory and four years later, was appointed assistant works manager at the Hancock

Chester H. Butterfield

Valve plant. In 1931 he became sales manager of the Hancock Valve division and in 1934, was appointed general sales manager of the locomotive equipment division for all products sold to railroads.

Financial

ATCHISON, TOPEKA & SANTA FE.—*Abandonment.*—Examiner R. Romero of the Interstate Commerce Commission, in a proposed report to the commission, has recommended that it authorize this company to abandon the operation and the New Mexico Central to abandon that part of its line extending from Kennedy, N. Mex., to Stanley, 18 miles, and that it refuse to give permission to abandon that portion of the line extending from Stanley, N. Mex., to Moriarty, 12 miles.

CHESAPEAKE & OHIO.—*Alleghany Regains Control of Collateral.*—Collateral comprising securities and cash owned by the Alleghany Corporation, top company of the so-called Van Sweringen system of holding companies, which has been impounded by the Guaranty Trust Company of New York, may be returned to Alleghany by virtue of an appraisal on March 9 which showed the value of collateral securing Alleghany 5's of 1944 to be 2.4 per cent above the minimum of 150 per cent of the par value of the bonds secured. In addition, the collateral securing two other issues of bonds, Alleghany 5's of 1949 and 5's of 1950, which was not appraised, has been released by reason of the resignation of Guaranty Trust Company as trustee for the two bond issues.

The indentures covering the three bond issues of Alleghany Corporation provide that collateral securing the issues be impounded by Guaranty whenever its value falls below 150 per cent of the face value of the bonds. For some time the appraised value of the collateral behind all three issues has fallen below 150 per cent par value and the cash and securities comprising the collateral has been in control of Guaranty. Collateral behind the 5's of 1944 includes the voting rights of 624,080 shares of Chesapeake & Ohio common and 780,100 shares of Chesapeake Corporation stock, while collateral behind the other two bond issues includes 363,200 and 25,120 shares of Chesapeake & Ohio common, respectively, and 454,000 and 43,900 shares of Chesapeake Corporation, respectively.

For some time there has been a dispute between Alleghany and Guaranty as to whether the latter may impound the assets behind all three issues of bonds if there is a collateral default for any of the issues, which Guaranty contends, or whether, as has been held by the Alleghany management, that the collateral which satisfies the 150 per cent par value requirement should be returned to the control of Alleghany. Counsel for Alleghany Corporation and Guaranty have agreed to release $75,000 of an excess of impounded income under the 5's of 1944 which Alleghany may utilize to satisfy certain obligations and perhaps finance the process of modifying the indenture provisions of the bond issues.

ILLINOIS TERMINAL.—*Abandonment.*—This company has been authorized by Division 4 of the Interstate Commerce Commission to abandon its Litchfield branch extending from Staunton, Ill., in a northeasterly direction to the terminus of the line at Litchfield, 15.3 miles.

LEHIGH & NEW ENGLAND.—*Annual Report.*—The Income statement of this road, for the year ended December 31, 1938, shows net income, after interest and other charges, of $337,798, as compared with net income of $382,943 in 1937, a decrease of $45,145. Selected items from the statement follow:

	1938	1937	Increase or Decrease
RAILWAY OPERATING REVENUES	$3,392,744	$3,689,201	−$296,457
Maintenance of way	360,398	380,225	−19,826
Maintenance of equipment	714,534	839,710	−125,176
Transportation	1,226,225	1,349,837	−123,612
TOTAL OPERATING EXPENSES	2,546,217	2,835,402	−289,184
Operating ratio	75.05	76.86	−1.81
NET REVENUE FROM OPERATIONS	846,526	853,799	−7,272
Railway tax accruals *	220,960	162,240	58,720
Railway operating income	625,565	691,558	−65,992
Net rents—Cr.	80,415	62,678	17,737
NET RAILWAY OPERATING INCOME	705,981	754,236	−48,255
Other income	24,192	31,826	−7,633
TOTAL INCOME	730,174	786,062	−55,888
Interest on funded debt	369,577	372,786	−3,208
TOTAL FIXED CHARGES	374,347	378,094	−3,747
NET INCOME	$337,798	$382,943	−$45,145

* (Including company's estimate of Federal taxes.)

LEHIGH VALLEY.—*Abandonment of the Loyalsock.*—The Lehigh Valley has asked the Interstate Commerce Commission for authority to abandon the operation and the Loyalsock has asked for authority to abandon the line extending from Splash Dam, Pa., to Lopez, 13 miles.

LEHIGH VALLEY.—*Interest Deferment Plan Operative.*—A plan of interest and maturities modification for this road was declared operative by its officers effective March 15. As of the close of business on March 14, 84.7 per cent of the total of $105,836,000 of securities affected by the plan had given assent. The plan, which was proposed in August, 1938, and approved by the Interstate Commerce Commission, Division IV, in February, provides that assent must be received from at least 80 per cent of each class of security. The *Railway Age* of August 27, 1938, carrier details of the plan.

NASHVILLE & ATLANTIC.—*Abandonment.*—This company has been authorized by Division 4 of the Interstate Commerce Commission to abandon its entire line extending from Campaign, Tenn., to Rocky Branch, 12 miles.

NEW YORK, NEW HAVEN & HARTFORD-NEW YORK CONNECTING.—*Joint Operation.*—The New York Connecting has asked the Interstate Commerce Commission for authority to continue operation under trackage rights over the line of the Long Island between Fresh Pond Junction, N. Y., and Bay Ridge. The New Haven has asked the commission for authority to continue operation over lines of the New York Connecting between Port Morris Junction, N. Y. and Woodside Avenue and over the

Continued on third right-hand page

lines of the Pennsylvania Tunnel & Terminal and through Pennsylvania station in New York City. The petitioners state that they do not believe they need commission approval for this continued operation, but are asking for authority only to find out the commission's viewpoint on the matter.

NEW YORK, NEW HAVEN & HARTFORD.—*Reorganization.*—Public hearings in this company's reorganization case have been postponed from March 27 to June 13, and the time within which amended plans, or amendments to, or modifications of, the principal debtor's amended plan of reorganization may be filed has been extended to May 31. Commissioner Mahaffie and Examiner Wilkinson will preside at the June 13 hearing in Washington, D. C.

PENNROAD CORPORATION.—*Statement for 1938.*—This corporation has adjusted the book values of the securities held by it to accord more nearly with market prices, although not purporting to represent the amounts realizable on disposition of such securities, according to the annual report for 1938 of Henry H. Lee, president. By reason of this move, the book value of total investments of the corporation, including advances to subsidiaries, was reduced from $134,993,049, as of December 31, 1937, to $47,033,531, as of December 31, 1938. The total reduction, amounting to $87,959,518 has been charged against earned surplus in accordance with prescribed accounting practice, although the deficit thus credited under earned surplus may, by action of the stockholders after May 1, 1929, be charged to capital surplus.

The corporation had a net income for the year, excluding net loss on sale of securities, of $555,582 as compared with a net of $2,267,314 for 1937. This decrease in income is laid primarily to the fact that the Detroit, Toledo & Ironton and Springfield Suburban paid no dividends during the year, and to the reduction in the dividends paid by the Canton Company of Baltimore. During the year the corporation sold 2,000 shares of Delaware & Hudson stock acquired in 1930, at a loss of $309,493 and had transactions in government securities at a profit of $5,378. The net loss of $304,115 in these transactions is charged against net income, in compliance with accounting principles adopted by the Securities Exchange Commission.

It is further reported that the voting trust agreement of May 1, 1929, in which all the issued and outstanding common stock of the corporation is deposited, will expire on May 1, 1939, and on and after that date voting trust certificates may be exchanged for common stock certificates of the corporation. At the end of 1938 there were 132,965 holders of voting trust certificates, a decrease of 2,261 from the previous year.

SOUTHERN PACIFIC.—*R. F. C. Loan.*—Division 4 of the Interstate Commerce Commission has approved a loan of $8,000,000 to this company by the Reconstruction Finance Corporation, the proceeds to be used to pay interest and principal on outstanding equipment trust certificates. The loan will run for a period of not exceeding three years.

SOUTHERN PACIFIC.—*Preliminary Report.*—The preliminary report of this company for the year ended December 31, 1938, shows net deficit, after interest and other charges, of $6,829,008, an increase of $7,585,801 over the 1937 figure. Selected items from the statement follow:

	1938	+Increase or −Decrease Compared with 1937
RAILWAY OPERATING REVENUES	$200,070,813	−$24,946,098
Maintenance of way	24,034,837	+271,628
Maintenance of equipment	34,227,853	−4,332,369
Transportation	80,758,416	−10,943,698
TOTAL OPERATING EXPENSES	157,246,668	−16,666,007
NET REVENUE FROM OPERATIONS	42,824,144	−8,280,091
Railway tax accruals	17,930,065	+931,317
Equipment and joint facility rents—Net	10,597,076	−892,131
NET RAILWAY OPERATING INCOME	14,297,003	−8,319,277
Other income	11,276,112	+935,795
TOTAL INCOME	25,573,116	−7,383,481
Rent for leased roads and equipment	29,366	+4,471
Interest on funded debt *	29,429,422	−591,623
TOTAL FIXED CHARGES	30,719,995	+16,500
NET DEFICIT	$6,829,008	+$7,585,801

* Bonds and notes.

TEXAS & PACIFIC.—*Removal of Offices.*—The corporate offices of the Texas & Pacific at Cleveland, Ohio, have been moved to Dallas, Tex., where stockholders meetings will be held in the future. Directors meetings will also be held in Dallas unless notice to the contrary is given.

UINTAH.—*Abandonment.*—Examiner W. J. Schutrumpf of the Interstate Commerce Commission, in a proposed report to the commission, has recommended that it authorize this company to abandon its entire line extending from a connection with the Denver & Rio Grande Western at Mack, Colo., to Watson, Utah, 63.1 miles, with branches extending from Dragon, Utah, to Dragon Mine, 1.1 miles, and from Rainbow Junction, Utah, to Rainbow, 4.2 miles.

UNION PACIFIC-NORTHERN PACIFIC.—*Abandonment and Joint Operation.*—The Interstate Commerce Commission, Division 4, has authorized the Union Pacific to abandon operation and the Oregon-Washington Railroad & Navigation to abandon the line extending from Waitsburg, Wash., to Dayton, 7.7 miles, and to operate over a line of the Northern Pacific between the same points. Also, Division 4 has authorized the Northern Pacific to abandon its line extending northeasterly from Wallace, Idaho, to Burke, 5.2 miles and to operate jointly with the Union Pacific over a line of the Oregon-Washington extending between the same points, 6.3 miles.

VENTURA COUNTY.—*Abandonment.*—The Interstate Commerce Commission, Division 4, has authorized this company to abandon 1.5 miles of line in Oxnard, Calif.

Average Prices of Stocks and Bonds

	Mar. 14	Last week	Last year
Average price of 20 representative railway stocks..	33.28	33.25	27.06
Average price of 20 representative railway bonds..	64.02	63.41	59.73

Railway Officers

FINANCIAL, LEGAL AND ACCOUNTING

W. C. Fitch, manager of perishable freight traffic of the Southern Pacific, with headquarters at San Francisco, Cal., has been promoted to freight claim agent, with the same headquarters, succeeding **J. R. Nixon,** who has retired.

W. E. Deaton, who has been engaged in land appraisal work for the Elgin, Joliet & Eastern, with headquarters at Joliet, Ill., has been appointed industrial and tax agent, with the same headquarters, a newly created position with the same duties.

William Wyer has resigned as secretary and treasurer of the Texas & Pacific, with headquarters at Cleveland, Ohio. **James J. Finegan,** assistant secretary, whose headquarters have been transferred from Cleveland to Dallas, Tex., and **L. T. McIntyre,** assistant treasurer, with headquarters at Dallas, will assume the duties of Mr. Wyer.

OPERATING

W. H. Irwin, first assistant superintendent for the Pullman Company, with headquarters at Houston, Tex., has been appointed acting district superintendent with the same headquarters, and **M. F. Cavanaugh,** second assistant superintendent at Houston, has been appointed acting assistant district superintendent at that point.

A. L. Stewart, supervisor of passenger service of the New York Zone of the Pennsylvania, has been appointed superintendent of passenger transportation, with headquarters as before at New York. **G. F. Walter,** supervisor of freight service of the New York Zone, has been appointed superintendent of freight transportation at New York. **R. B. M. Burke,** supervisor of stations and transfers of the New York Zone, at New York, has been appointed superintendent of stations and transfers.

Leonard A. Gregory, whose promotion to superintendent of the San Antonio-Palestine division of the International-Great Northern (Missouri Pacific Lines), with headquarters at Palestine, Tex., was announced in the *Railway Age* of February 18, was born at Caddo, Indian territory, on December 1, 1895, and entered railway service in 1912 in station service on the St. Louis Southwestern. He was subsequently promoted through several positions, becoming successively chief clerk to the superintendent, secretary to the general manager and chief clerk to the general manager. On February 1, 1919, he went with the International-Great Northern as chief clerk to the general manager. In May, 1921, he was promoted to assistant to the general manager, and in March, 1923, he was appointed superintendent of transportation. Mr. Gregory was appointed trainmaster on the Gulf Coast

Lines of the Missouri Pacific, with headquarters at DeQuincy, La., on September 15, 1926, and on February 1, 1930, he was promoted to assistant superintendent, with the same headquarters, the position he held at the time of his recent promotion.

TRAFFIC

S. C. Chiles, general eastern freight agent of the Southern Pacific, with headquarters at New York, has been appointed, effective April 1, general freight agent of the Southern Pacific Steamship Company (Morgan Line) in charge of freight rates, solicitation and service, with headquarters at New York, succeeding to the duties of **William Simmons,** traffic manager, who will retire on pension on that date, and the position of traffic manager will be abolished. Effective the same date, **E. E. Rutherford,** general agent on the Southern Pacific at New York, will be promoted to general eastern freight agent at that point, replacing Mr. Chiles and **H. F. Starke,** general agent at Pittsburgh, Pa., will be transferred to New York, relieving Mr. Rutherford. **E. N. Hurd, Jr.,** general agent at Washington, D. C., will be transferred to Pittsburgh to succeed Mr. Starke and **W. H. Herrin,** assistant chief clerk in the general office at Chicago, will be promoted to general agent at Washington replacing Mr. Hurd.

A. D. Martin, general passenger agent of the Chicago, Rock Island & Pacific, with headquarters at Chicago, has been promoted to assistant passenger traffic manager, with the same headquarters. Mr. Martin was born at Grant City, Mo., on December 11, 1886, and entered the service of the Rock Island on September 3, 1908, as a telegrapher. On April 8, 1914, he

A. D. Martin

was appointed ticket agent at Iowa City, Iowa, and on December 26, 1921, he was advanced to traveling passenger agent at Des Moines, Iowa, being transferred to Buffalo, N. Y., on September 1, 1924. Two years later Mr. Martin was promoted to general agent, passenger department at Detroit, Mich., and on August 4, 1928, he was transferred to Omaha, Neb. Mr. Martin was advanced to general passenger agent on June 15, 1936.

ENGINEERING AND SIGNALING

E. T. Barrett, who has been on a leave of absence while acting as superintendent of the Rio Grande Southern, has returned to his former position of engineer of track of the Denver & Rio Grande Western, with headquarters at Denver, Colo., and **A. L. Kleine,** acting roadmaster with headquarters at Helper, Utah, has been promoted to assistant engineer of track, with headquarters at Denver.

SPECIAL

Paul W. Van Camp, whose appointment as publicity representative of the Central region of the Pennsylvania at

Paul W. Van Camp

Pittsburgh, Pa, was noted in the *Railway Age* of March 11, has spent 16 years in newspaper work. Mr. Van Camp was born in Minnesota, and attended Hamline University, St. Paul, Minn. In 1923 Mr. Van Camp joined the staff of the Akron Press, Akron, Ohio, as reporter and following the merger of that newspaper with the Times he continued on the staff of the Akron Times-Press for 11 years, during which, at various periods, he was Sunday editor, promotion editor, assistant city editor and make-up editor. In 1935, Mr. Van Camp was transferred to Pittsburgh as a member of the staff of the Pittsburgh Press. For the last four years he has done copy desk and other special work, including the preparation of a series of articles on industries of Pittsburgh and the Pittsburgh district. Mr. Van Camp is now in general charge of the publicity and public relations work of the Pennsylvania throughout its Central region, which embraces the territory covered by the main lines and branches from Altoona, Pa., on the east to Columbus, Ohio, and Cleveland on the west.

OBITUARY

Martin V. Nugent, assistant freight claim agent on the Illinois Central, with headquarters at Chicago, died on January 23, at Fort Myers, Fla., after a long illness.

William Franklin Dudley, at one time auditor of the Chicago, Milwaukee, St. Paul & Pacific, who retired on January 1, 1930, as credit officer with headquarters at Chicago, died on March 12 at his home in Evanston, Ill. Mr. Dudley was born at Greenbush, N. Y. on December 4, 1851, and entered railway service in 1874 in the auditing department of the Milwaukee. In 1897, he was promoted to assistant general auditor and in 1910, his title was changed to auditor. In 1913 he was appointed auditor of traffic and in 1920, he became credit officer, with headquarters at Chicago, the position he held at the time of his retirement. He was one of the organizers, in 1887, of the American Association of Railway Accounting Officers, the predecessor of the Railway Accounting Officers Association.

Bruce Scott, vice-president and special counsel of the Chicago, Burlington & Quincy, with headquarters at Chicago, died on March 14 of coronary thrombosis in Pasadena, Cal. Mr. Scott was born at Kaneville, Ill., on March 18, 1874, and graduated from the University of Pennsylvania in 1895. Later he took postgraduate work at the University of Chicago, the University of Wisconsin and the University of Berlin during 1905, 1906 and 1907. Mr. Scott was admitted to the Illinois bar in 1897 and practiced law at Aurora, Ill. from 1897 to 1905. From 1900 to 1905, he was also local attorney for the Burlington at Aurora. In 1906, he became a member of the political science and law faculties of the University of Wisconsin at Madison, Wis., then returning to railway service as general attorney of the Burlington at Chicago in 1911. From 1917 to 1924, Mr. Scott served as general solicitor, except during the period of the World War, from January 1, 1918, to March 1, 1920, when he acted as general solicitor

Bruce Scott

for the United States Railroad Administration. In 1924, he was promoted to general counsel of the Burlington and of the Colorado & Southern and was elected a director of both companies. He was further advanced to vice-president and general counsel of the two railroads on December 10, 1928, and on July 1, 1937, his title was changed to vice-president and special counsel, the position he held at the time of his death.